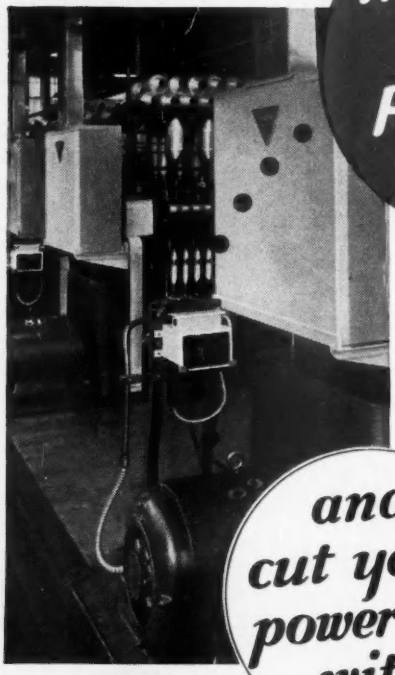
ELECTRICAL TIMES

THURSDAY
13 DEC.
1951
NINEPENCE

1·5 kVAr Capacitors installed at Messrs. A. S. Orr & Co. Ltd. mill, Bamber Bridge, Nr. Preston. Contractors: Stewart Porter, Chorley, Lancs.



IMPROVE YOUR POWER FACTOR

BICC Power Capacitors connected to your motors will automatically improve the power factor and so reduce losses to a minimum. When tariffs include a power factor clause, BICC Capacitors make a direct and valuable saving on your power bill—and usually pay for themselves within a short period.

They are easy to install and occupy little space. Control is simple, losses are small and maintenance is negligible. Write to-day for Publication 251V., giving further details. Specialist BICC Engineers are always available to advise freely on any power-factor problems.

and cut your power costs with

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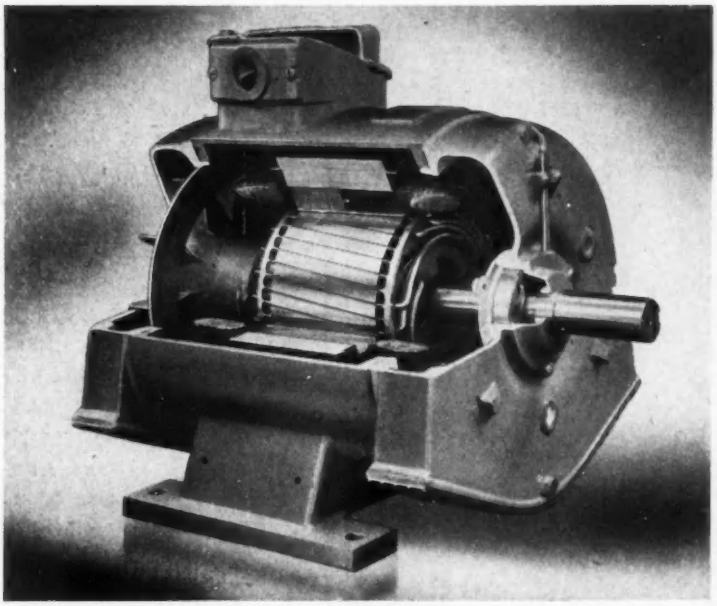
The mark that means that "little more" in quality



Partly sectioned TRISLOT motor of small-medium size

The "TRISLOT", for example . . .

The wide range of L.S.E. electric motors includes many types with outstanding characteristics.

The TRISLOT, for example, is a squirrel-cage motor which develops a higher starting torque for a given starting current than any ordinary design. Not only is it the natural choice for drives involving high starting torque, but its low starting current permits its use in the majority of instances in place of the more expensive slip-ring machine. It needs only the simplest form of squirrel-cage starter.

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AUTOMATIC CIRCULATORS AND IMMERSION HEATERS

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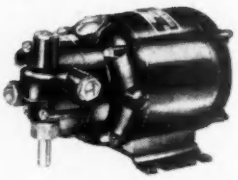
Electric Motor Units



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Max. Torque 4 lb. in.
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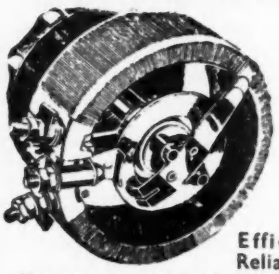

Efficient and Reliable, these instruments are second to none. Our Technical service will be happy to advise you in any difficulty, so do not hesitate to get in touch with us soon.

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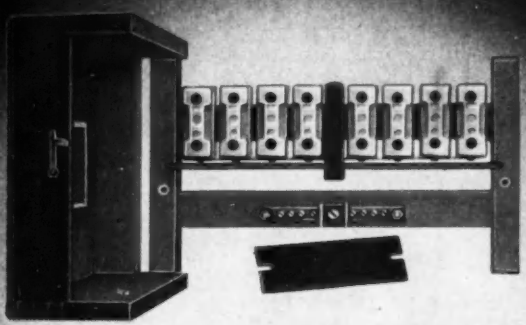
You cannot buy better gear



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MADE FOR 5/15, 15, 20 AND 30 AMPERES, 250 VOLTS; 1-12 WAY; DOUBLE POLE, SINGLE POLE AND NEUTRAL.

MIXED AMPERE FUSEWAYS TO SPECIAL ORDER.

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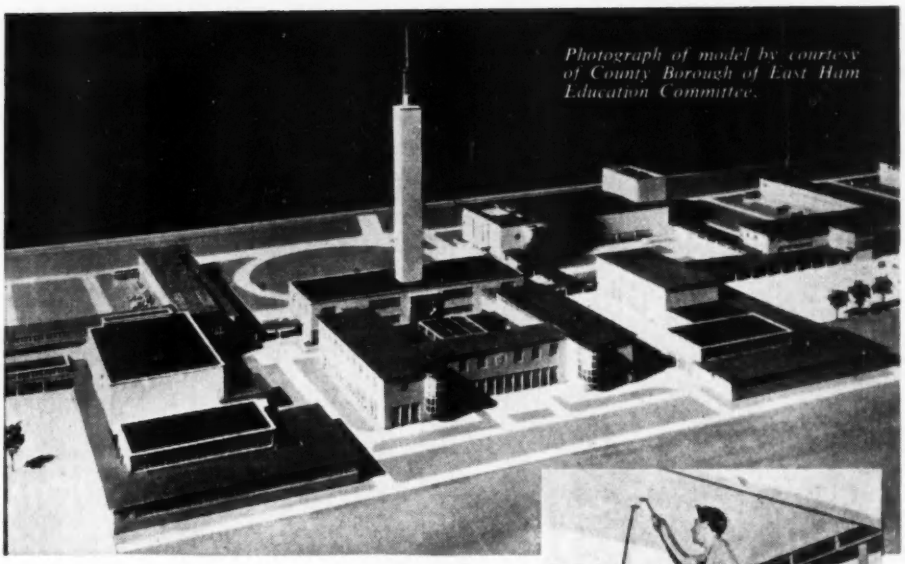
THIS picture
is not entirely imaginary
because, although
supplies of fires are still limited,
Belling cookers are
more plentiful. We look forward to even
better times next year. Please
accept our best wishes for a very
happy Christmas and
a prosperous New Year
of plenty.

BELLING & CO. LTD., BRIDGE WORKS, ENFIELD, MIDDX. HOWARD 1212

CRC384

EAST HAM SCHOOLS PROJECT

takes 70 miles of Crompton Cable



Photograph of model by courtesy of County Borough of East Ham Education Committee.

This fine modern schools scheme designed for the East Ham Education Authority comprises three Secondary Schools for a total of 1,700 pupils, central administration block, dining rooms and kitchen.

For the electrical installation in this major building project, 70 miles of Crompton rubber cable are to be used in addition to 5,000 yards of Crompton paper insulated cable. Crompton lamps, fluorescent tubes and lighting fittings are also being supplied.

More and more leading contractors are specifying Crompton cable for every kind of scheme because its consistent quality means easier, quicker wiring.

The schools were designed in the department of the Borough Engineer & Surveyor, Mr. F. C. Ball, B.Sc., A.M.Inst.C.E., Chief Assistant Architect, Mr. J. W. Taylor, A.R.I.B.A. General Contractors, W. & C. French, Ltd. Consultant for mechanical and engineering services, E. Wingfield Bowles & Partners. Electrical Installation by Rashleigh Phipps & Co., Ltd.

Crompton

RUBBER CABLE

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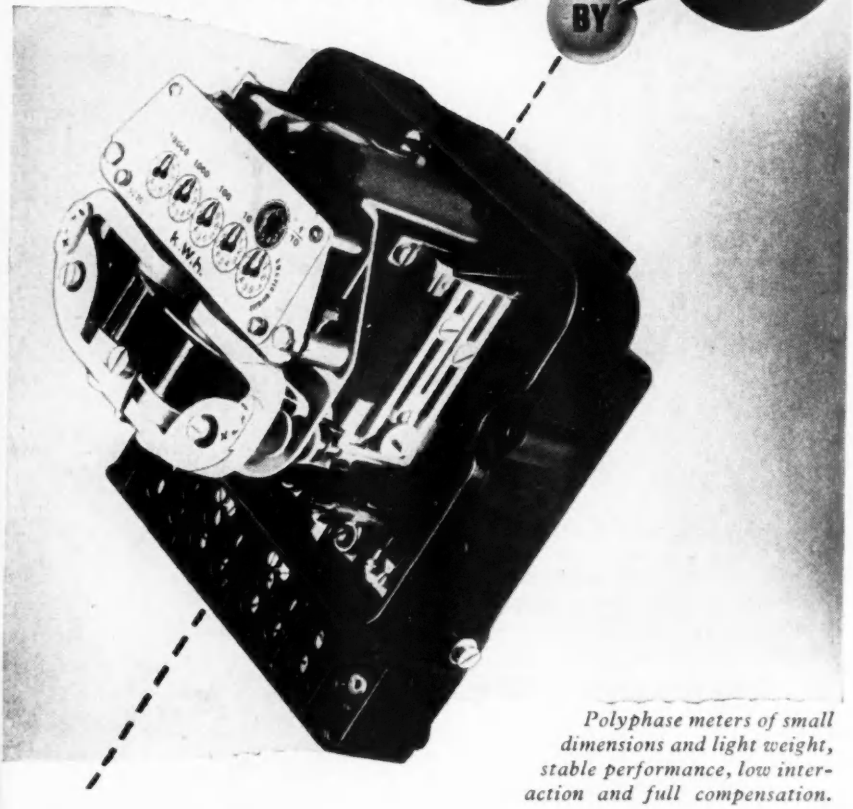
Telephone : CHAncery 3333 *Telegrams : Crompark, Estrand, London*

We are one Company operating in three different fields. In this advertisement we illustrate a product of the Electricity Meter Division.

GROWTH BY DIVISION



Polyphase meters of small dimensions and light weight, stable performance, low interaction and full compensation.

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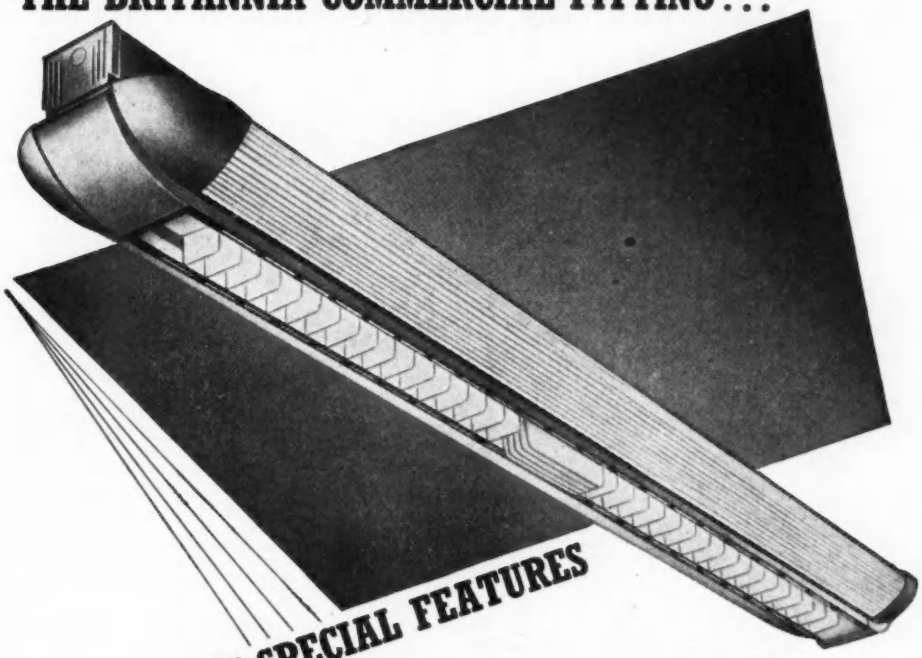
A Company of the Parkinson & Cowan Group

THE BRITANNIA COMMERCIAL FITTING...



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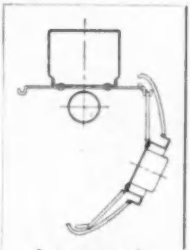
- HINGED LOUVRE-DIFFUSER
- UNIQUE ETCHED SILVER FINISH
- SPRUNG LAMPHOLDERS
- GOOD UPWARD LIGHT

The Commercial Fitting, in common with all Britannia fittings, combines fine looks with the many technical refinements, not only for extreme simplicity of erection and maintenance but for general lighting efficiency:—

1. Direct lamp light above the horizontal.
2. Diffused light only in all zones from the horizontal to 40° below it.
3. Direct lamp light plus diffused light, in all zones lower than 40°, on to the working plane.



Louvre open for cleaning and lamp replacement.

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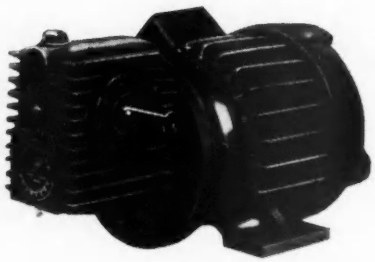

1/8th H.P. up to 1 H.P.
Ratios 7½ - 60 inclusive

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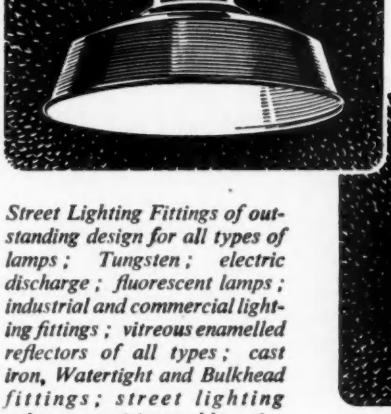
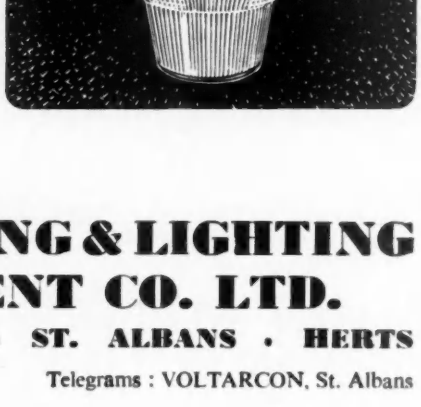
SPECIALISTS IN *Modernised*

INDUSTRIAL • COMMERCIAL • STREET LIGHTING



Modern lighting is work for the specialist. That is why it pays to consult E.L.E.C.O. — the specialists with over 50 years' experience in the design and manufacture of all types of Industrial, Commercial and Street Lighting fittings.



Street Lighting Fittings of outstanding design for all types of lamps; Tungsten; electric discharge; fluorescent lamps; industrial and commercial lighting fittings; vitreous enamelled reflectors of all types; cast iron, Watertight and Bulkhead fittings; street lighting columns; raising and lowering gear; switches.

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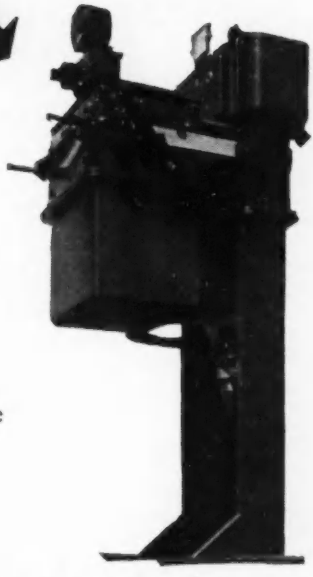
We feel almost maternal about our switchgear and we're prepared to go to great lengths to keep it working sweetly. Not that we're called out every day. Our switchgear—and our customer's maintenance—is too good for that. But should a customer require additional service and call us out, we're there before you can say : Reyrolle for reliability.



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MOULDED LAMPHOLDERS

for every installation need

The attractive range of Tucker shockproof lampholders gives a wide selection for flexible cable, batten and Home Office requirements. The famous TITAN A754 pattern has established a well merited popularity by its sound design and sturdy construction with solid one-piece plungers providing straight-through uninterrupted contact between cable and lamp cap.

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Makers of First-Grade Electrical Accessories since 1892

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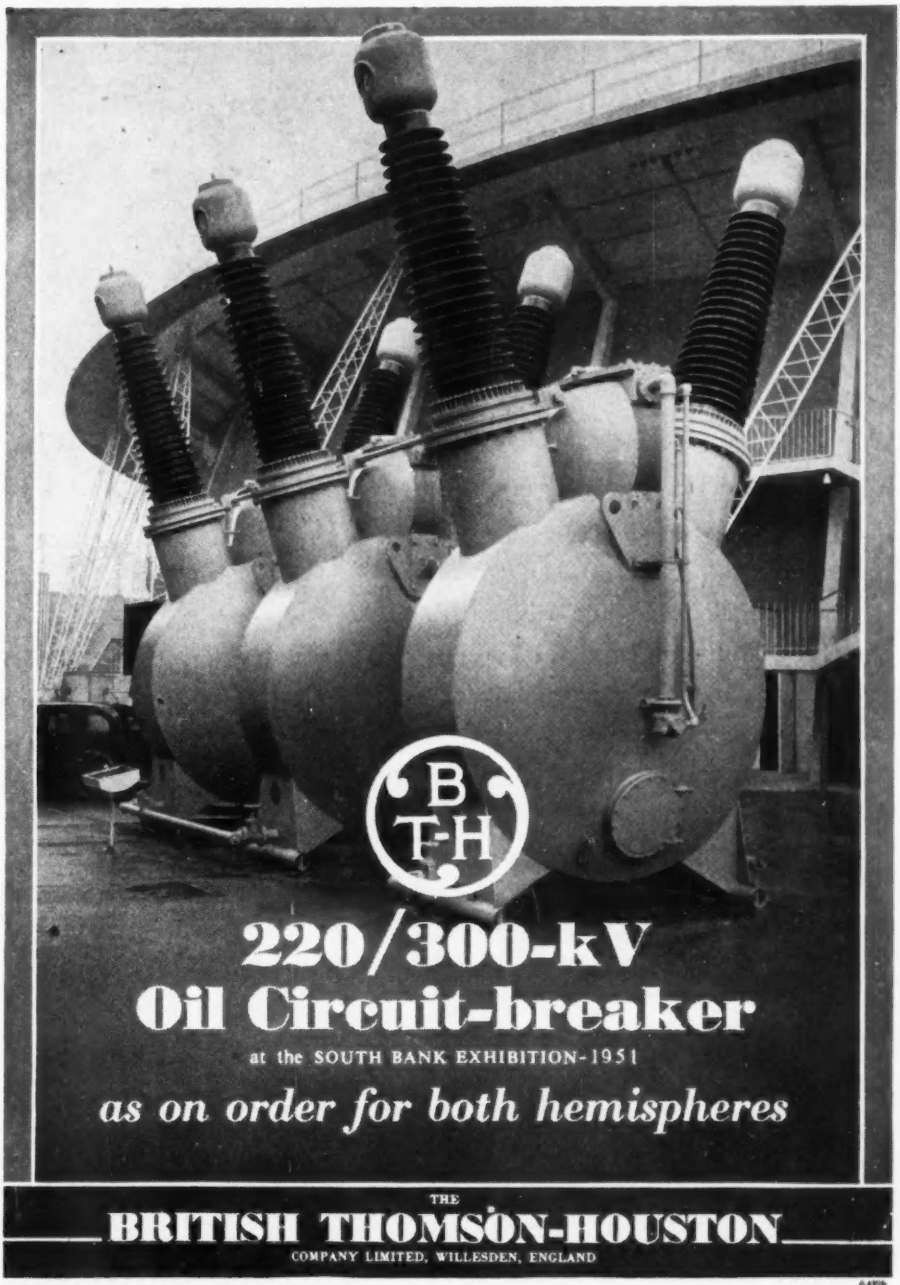
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220/300-kV
Oil Circuit-breaker
at the SOUTH BANK EXHIBITION-1951
as on order for both hemispheres
THE
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ready for any 'Resistance' . . .

and famous for his Reliability. Like the proverbial 'arm of the law' he is built on robust lines, which has quite a lot to do with the amazing life and efficiency of Birch Resistances in their many applications, so various and often so exacting. Note the range of standard types of Resistances outlined below.

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DIMMERS—REGULATORS (Field, Shunt, Voltage)
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All Resistance problems come within our scope. Please call on us to help you solve any problem which may arise.

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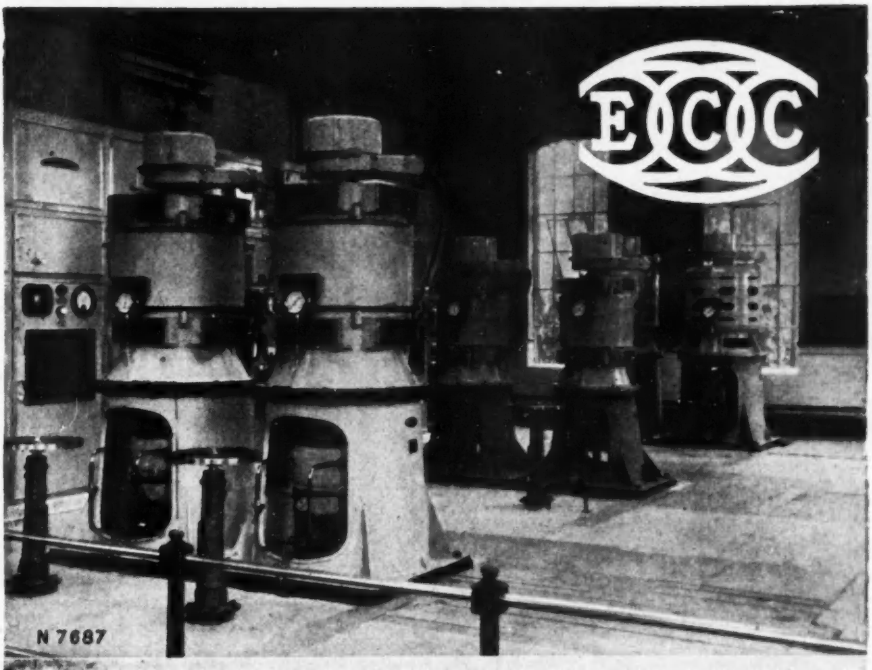

PUMPING WATER AT BIRMINGHAM

This illustration is reproduced by permission of the BIRMINGHAM CITY WATER DEPARTMENT
C. R. Risbridger Esq.,
B.Sc., M.Inst.C.E.
Chief Engineer.

Six vertical spindle centrifugal motors driving Sulzer pumps at Frankley Pumping Station.

Two of the motors are of 410 h.p., two of 340 h.p. and two of 170 h.p. capacity.

These motors are supplied from the 400 volts side of 11 kV/400 volt step-down transformers. The electrical equipment comprising motors, H.T. switchgear, step-down transformers, L.T. motor control and distribution switchgear and rectifiers for D.C. services in this station were supplied by E.C.C.

ESTABLISHED 1882
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BUSHBURY ENGINEERING WORKS
WOLVERHAMPTON
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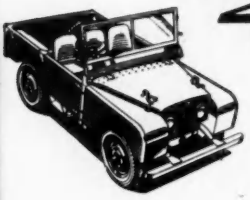
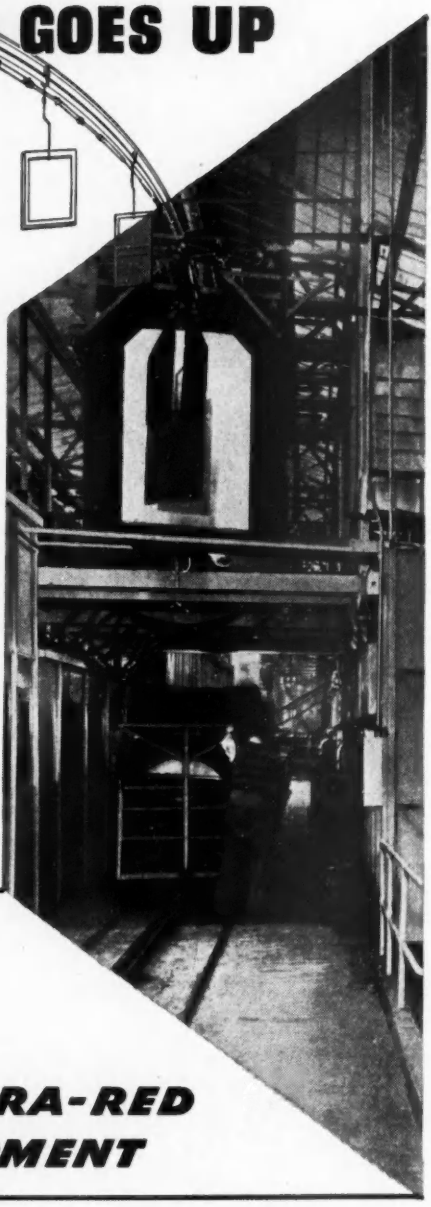
PRODUCTION GOES UP

for the

LAND-ROVER



The pressed aluminium sections of the " Land Rover " are taken high up above floor level for processing in G.E.C. Infra-Red Lamp Plants. Plants which dry the sections after surface pre-treatment and subsequently stove the paint on them, taking just a few minutes for each of these operations. Because they heat quickly and uniformly they can be incorporated into the production line. Because they are of comparatively light weight construction they can be erected overhead.
If you are interested in speeding your finishing process, conserving floor space and cutting down production costs consult the G.E.C. Specialists in infra-red heating will be pleased to advise you.



- SAVES SPACE
- SAVES TIME
- SAVES MONEY

G.E.C. INFRA-RED HEATING EQUIPMENT

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

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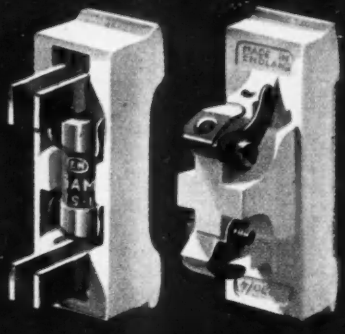
right through

FOR SINGLE POLE AND NEUTRAL DUTY



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MEMSPEL and MEMSPAN are the steel-clad and all-insulated versions of an entirely new range of switch-fuse gear designed by MEM for single pole and neutral installations. All the skill of MEM's design team has gone into this job. Outstanding features are extreme compactness and simplicity of wiring—slow break A.C. switch, choice of BS1361 cartridge or rewirable fuses with interchangeable holders, and effective interlocking. Available in steel-clad and all-insulated units for 15, 30 and 60 amps including 2, 3 and 4 way splitters.

You will be delighted with the excellent design and fine workmanship, particularly when you check the attractive prices.

Send for new Switchcraft catalogue (List No. 311) and full details of the new range.

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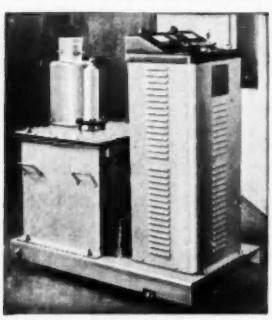
Branches in London & Manchester

This is an electrical seashell

Diala Phasianella

The delicate, attractive Diala shells are found in the warm waters of the West Pacific. Diala Phasianella (pheasant Diala) has a semi-transparent shell, less than a quarter of an inch long. The smooth, whitish surface is elegantly decorated with chestnut-coloured markings in the form of minute spots and faint lines.

Shell Diala Oils are specially designed for electrical applications. They are recommended for transformers, oil-filled switchgear and capacitors, and for general insulating and dielectric purposes. Shell Diala Oil "B" complies with the British Standard Specification 148 1951.



Seashell Oils are produced as the result of world-wide research. This picture shows apparatus for determining breakdown voltage—one of the various tests carried out on electrical insulating oils prior to despatch.

The Seashell range of specialised industrial lubricants, which includes Shell Diala Oils, is marketed throughout the world. There is a Seashell grade for *every* industrial use—and each of these grades is available everywhere in the same high quality. Shell lubrication engineers will be pleased to provide further information and to make specific recommendations for particular purposes.

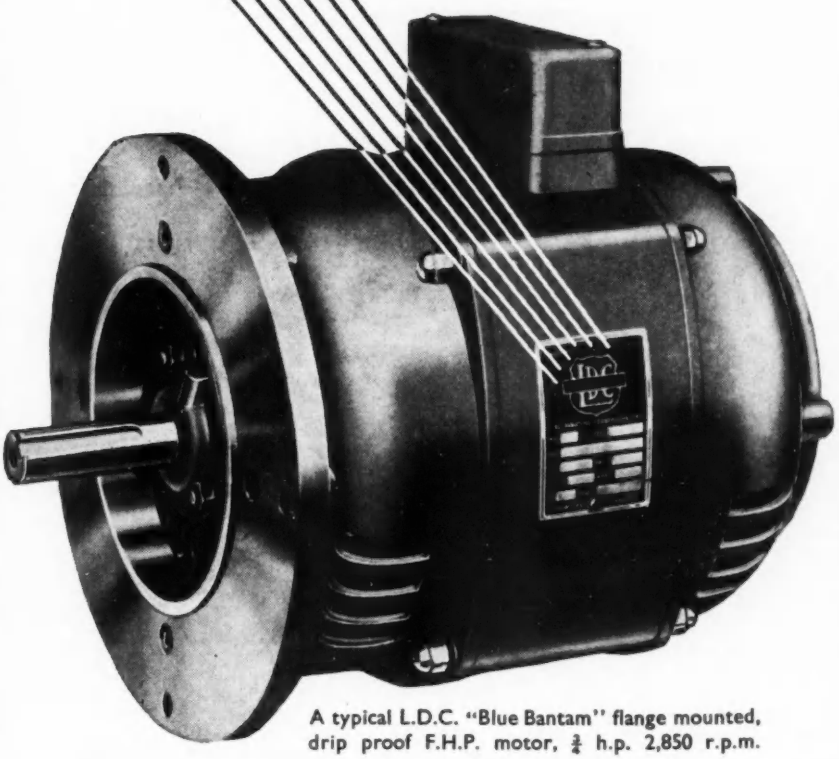
Shell *Diala* Oil

SHELL

LEADERSHIP IN LUBRICATION

LANCASHIRE CRYPTO

The Symbol of Power in Industry for over 50 Years



A typical L.D.C. "Blue Bantam" flange mounted, drip proof F.H.P. motor, ¾ h.p. 2,850 r.p.m.

There is an L.D.C. motor with the correct enclosure, including Flameproof, for any industrial situation.

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S.P. TRANSFORMER BUSHINGS

By the use of a complete range of interchangeable parts, a wide variety of standard bushings can be made up promptly for voltages from 600 volts to 88kV. Current ratings from 150 to 1500 amps.

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S.P.49

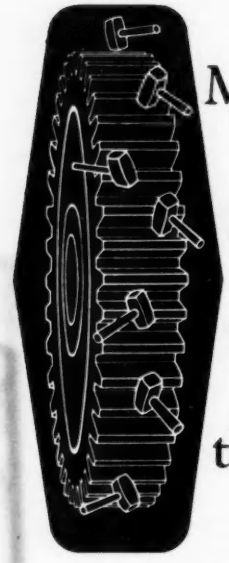
✳ *The Jacksomime Season* . . . GREETINGS TO THE INDUSTRY

Baron Beef of Electricity Hall

'Tis Fairy Cleanline's Wedding Day,
Ten thousand watts I'll give away.
On second thoughts—I think it best
To leave the Power
locked in the chest!

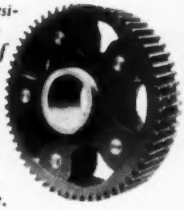
Economy—as *Jackson* make it
Means the load can always take it!

THE JACKSON ELECTRIC STOVE CO. LTD., 143, SLOANE STREET, LONDON, S.W.1



Metrovick gears take the shock

The severe shock loads imposed upon gear teeth when rail points or crossings are traversed at high speeds require their design to be far more robust than normal industrial gears. Design and manufacture of traction gears must be directly related to the design of the traction motor. Metrovick experience in the production of traction motors therefore means that M-V gears incorporate all those features arising from practical traction needs. Solid, composite or resilient, spur or helical, all types of gears for rail or road traction can be supplied by Metropolitan-Vickers.



Metrovick rubber resilient gear wheel for a tramcar. Gears of this type protect motors against impact shocks and vibration, lengthen life of motors, gear wheels and pinions, while reducing noise.

METROPOLITAN-VICKERS ELECTRICAL COMPANY LTD.,
TRAFFORD PARK, MANCHESTER, 17. *Member of the A.E.I. group of companies*

METROVICK

Gears for all Traction Drives

The Consumer of DUST
Secomak
REGD
NEW MODEL 51
INDUSTRIAL
VACUUM CLEANER
Unique design makes this, weight for size, the most economical and powerful portable Vacuum Cleaner available. One man operated, it is built for easy manipulation in confined spaces.
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Universal AC/DC power unit 1,200 watts.
110 lbs. weight.
Generous size pneumatic tyres.
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SERVICE ELECTRIC
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SECOMAK WORKS, HONEYPOT LANE,
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AQ 9

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FOR UNDERGROUND CABLES

EXTREMELY EASY TO LAY, NO PROJECTION AT JOINTS, LONG LENGTHS, FEW JOINTS, PERFECT ALIGNMENT.

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THE KEY ENGINEERING CO., LTD.

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Telephone: CITY 1185/6

and
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Tel.: TRAFFORD PARK 1903

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POWER ECONOMY WITH MAXIMUM ILLUMINATION

The Holophane Enclosed Translucent Industrial Unit illustrated achieves ideal light distribution by directing 75% of light downwards on to the working plane and 20% upwards for general illumination. An abrupt transition from clearly defined and darker surroundings is thus avoided. Improved colour quality is provided by the blue tinted Correctolite Glass.

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WITH FLEXIBLE DRIVE

Some just happen; this one was designed . . . . designed to cut out the snags . . . designed for minimum maintenance . . . designed (note the flexible drive) for easy fitting . . . designed — and made — by people who know.

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Domestic temperature controls

SUNVIC CONTROLS LTD. SUNVIC HOUSE, ESSEX STREET, STRAND, LONDON, W.C.2
Member of the A.E.I. Group of Companies

TAS/SC. 2-4

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ELECTRIC FIRES OF DISTINCTION

- *MODERN*
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Insist on Angelus and have the benefit of our fifty years experience and our excellent service.

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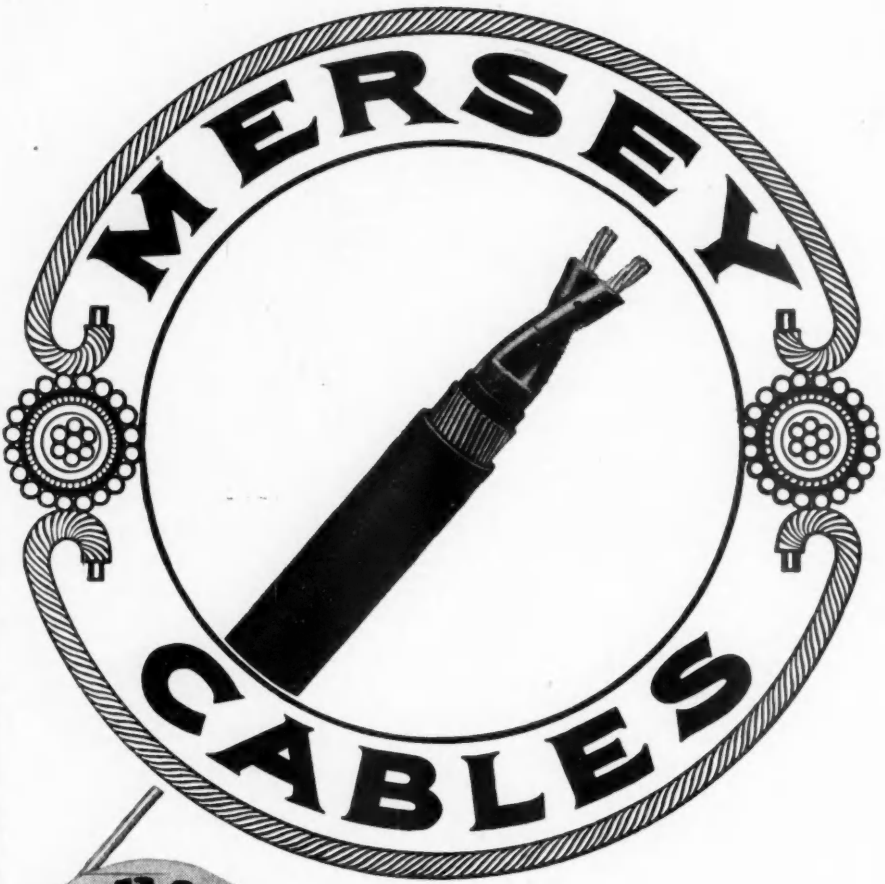

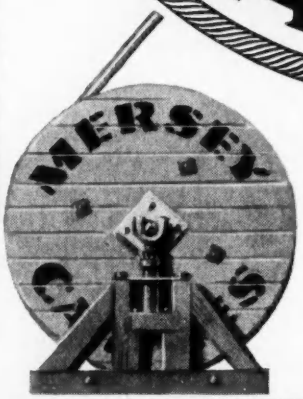

All Sizes of rubber insulated wires, cables and flexibles are made under the famous MERSEY name. *Illustrated is a 7/.036 Twin V.I.R. Insulated, Jute filled, S.W.A. and Served Cable. 250 Volt. To B.S. 7/1946*

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LINDLEY THOMPSON TRANSFORMERS
HERMETICALLY SEALED!

Reliability in service—and therefore maximum safety over the longest period—is the outstanding virtue of Lindley Thompson Transformers. Large numbers of **Thompson Relief Chambers** have been in service for a considerable time and have given trouble-free service under damp and humid conditions . . . in India, East Africa, Ceylon, etc. NO MOISTURE or ACIDITY OF OIL, NO SLUDGING OF OIL, NO SERVICE COSTS . . . just perfect all-the-year-round transformer operation.

(above)
100 kVA, 3-phase, 50 cycles. Voltage ratio 11,000/500 Delta/Star fitted with off-load switch. H.T. Outdoor bare type terminals and arcing horns. L.T. Outdoor bare type terminals. Thompson Relief Chamber and Protective cover.

(on right)
FOR TROPICAL USE.
1,500 kVA, voltage ratio 6,600/433 volts. Thompson Relief Chamber and Protective Cover.

LTTS

TWO YEARS GUARANTEE WITH ALL TRANSFORMERS

THE LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD., ST. MARY'S ROAD, MIDDLE GREEN, SLOUGH, BUCKS. 'PHONE: LANGLEY (Bucks) 200/201

"Megger" Insulation Testers Widely Used in American Industry

"Bridge-Megger" Tester at Philadelphia Locomotive Works

The Baldwin Locomotive Works, where some of America's finest diesel-electric locomotives are made, rely on "Megger" Insulation Testers for routine tests forming part of their electrical inspection. This is only one example of the very wide use of these sturdy British instruments by public authorities and private organisations throughout America.

At the Baldwin works, where insulation tests are made on both individual components and their assemblies, the importance of regular and systematic insulation testing is fully appreciated. The safety of electrical installations and apparatus, the safety of employees, and the timely avoidance of costly and inconvenient breakdown depends chiefly on the condition of the insulation of the equipment.

Publication J 200 explains how insulation may be tested quite simply with the help of "Megger" Insulation Testers, and the results recorded with permanent benefit to the maintenance engineer.

SEND FOR THIS. Details of all standard Evershed products are contained in a new General List. *Ask for Publication J* 242.

Carrying out an insulation resistance test with a "Bridge-Megger" Tester, Series 2, on the lighting circuit in the control chassis on a 1,000 h.p. Diesel-electric locomotive at the Baldwin Locomotive Works, Eddystone, near Philadelphia, U.S.A. These tests are made in the Quality Control Section of the Works before the control chassis is mounted on the locomotive. The Wheatstone Bridge is used for tests on the auxiliary generator, coils and resistors.

Evershed Tachometer Aids Car Output

An Evershed Tachometer transmitter coupled to the motor on a King Conveyor driving four production lines at the Rover Solihull works is linked to an Evershed Tachometer Indicator in the Production Manager's Office, and an Evershed Tachometer Recorder in the Chief Planning Office.

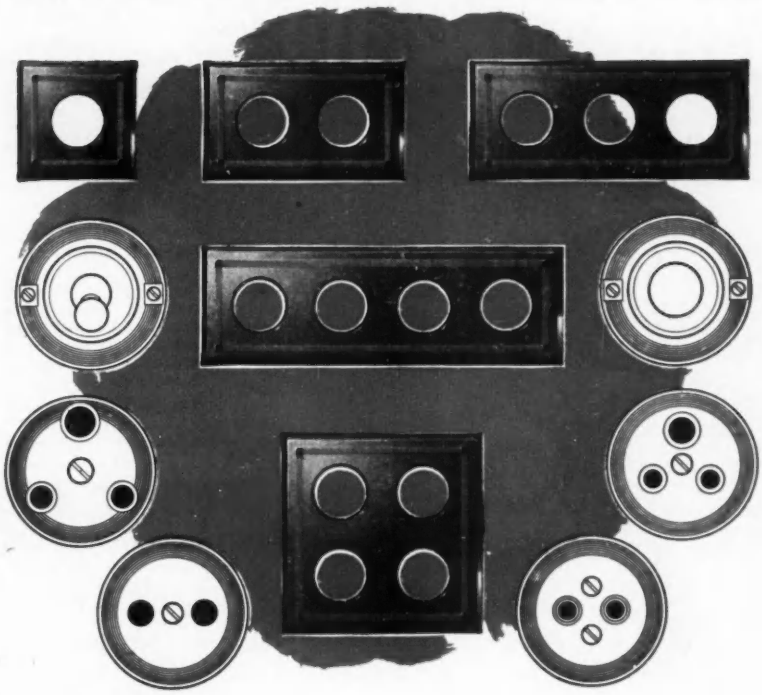
Together they provide a "permanently visible check upon production . . . and a permanent record of this information," thus aiding a full-out production effort. *Evershed Tachometers are described in Publication J* 224.

EVERSHED

PROCESS CONTROLLERS · INDICATORS AND RECORDERS
REMOTE CONTROLLERS · MEGGER TESTERS

EVERSHED & VIGNOLES LIMITED *Acton Lane Works, Chiswick, London, W.4*
Telephone: Chiswick 3670 Telegrams: Megger, Chisk, London Cables: Megger, London
5/187

ADVANTAGES OF THE "JACELITE" PLATE FRAME



Harmony

There are no "special" assemblies on a flush installation where "Jacelite" Plate Frames are employed. From a single switch, socket-outlet or bell-push point to a multigang assembly embodying any combination of these accessories, each unit is erected — either horizontally or vertically — from a small number of interchangeable components.

The result is an installation which achieves both a pleasant harmony in appearance and a uniformly high standard of reliability.

CRABTREE

A · NAME · SYNONYMOUS · WITH · PROGRESS · IN · ACCESSORIES · AND · SWITCHGEAR

"Crabtree" (Registered

C.651/102 Advt. of J. A. Crabtree & Co. Ltd. Walsall, Staffs., England

Insist on **"GRUBB"**

All Electric

IMMERSION HEATERS

OR

CIRCULATORS

Thermostatically controlled HOT WATER available at all times

Guaranteed for TWO YEARS

LOADINGS available in 2, 3 and 4 kW

IMMERSION HEATERS from 12" to 42"

CIRCULATORS for soft water areas only Sizes : 16" to 42"

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BIRMINGHAM 12

EXPORT ENQUIRIES INVITED

Steel

WHEELBARROW

All barrows can be supplied with Pneumatic, Solid Rubber or Steel wheels.

Specially constructed. No bolt holes at vulnerable points. Heavily banded body and other unique characteristics ensure the most durable barrow on the market.

Can be supplied in all sizes.

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CLOSED CIRCUIT AIR COOLERS

have already been installed in such IMPORTANT POWER STATIONS as Meaford, Hull, Letchworth, Darlington, Stockport, Stepney, and Huddersfield. And overseas in Johannesburg and Adelaide, as well as numerous other large and small power stations. They are of tubular construction with no normal connection with the outside atmosphere.

THE PREMIER COOLER & ENGINEERING CO., LTD.

Shalford Nr. Guildford Surrey.

OIL SWITCH FUSE

Various other arrangements and combinations of this unit are available including:

Ring main Tee-off Equipments.

Transformer Tank mounting.

With Busbar Metering Equipment, etc.

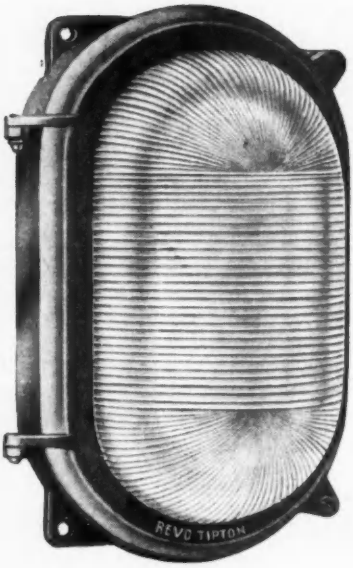
Write for copy of descriptive Publication No. 555.

IMPULSE TESTED

STATTER

J. G. STATTER & CO. LTD. 82, VICTORIA STREET, LONDON, S.W.1.

A Newcomer to the REVO range . . .



C.13558

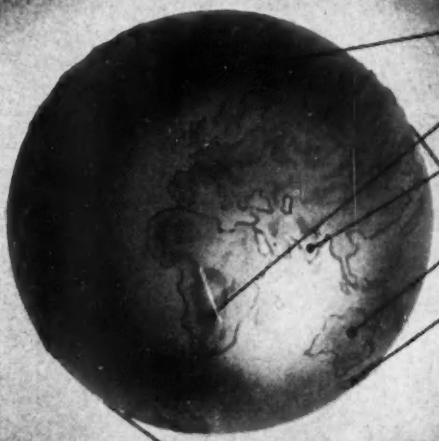
Here is an attractive addition to the wide range of Revo lighting equipment—a Bulkhead fitting of aluminium alloy—light yet exceptionally strong and durable.

Features include: prismatic glass with smooth outer surface, weatherproof door with two locking points, fixing holes for vertical or lateral mounting on brickwork, etc., etc.

REVO REGD

Industrial LIGHTING FITTINGS

REVO ELECTRIC CO. LTD., TIPTON, STAFFS.



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Renowned throughout the World for Quality..

DEPENDABILITY

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Telephone: Arthington 98 and 99 Telegrams: Whiteley, Pool-in-Wharfedale

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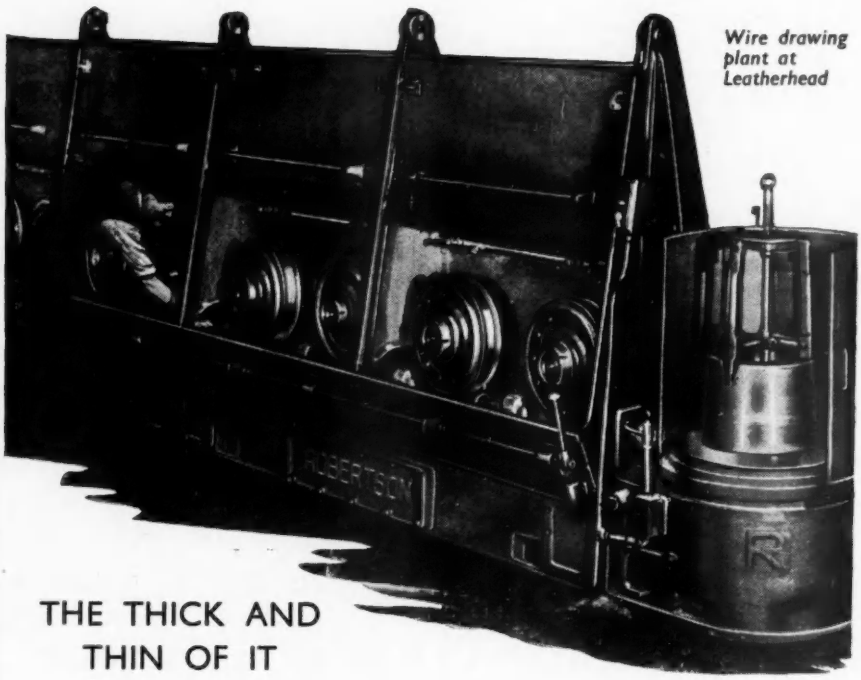


Wire drawing plant at Leatherhead

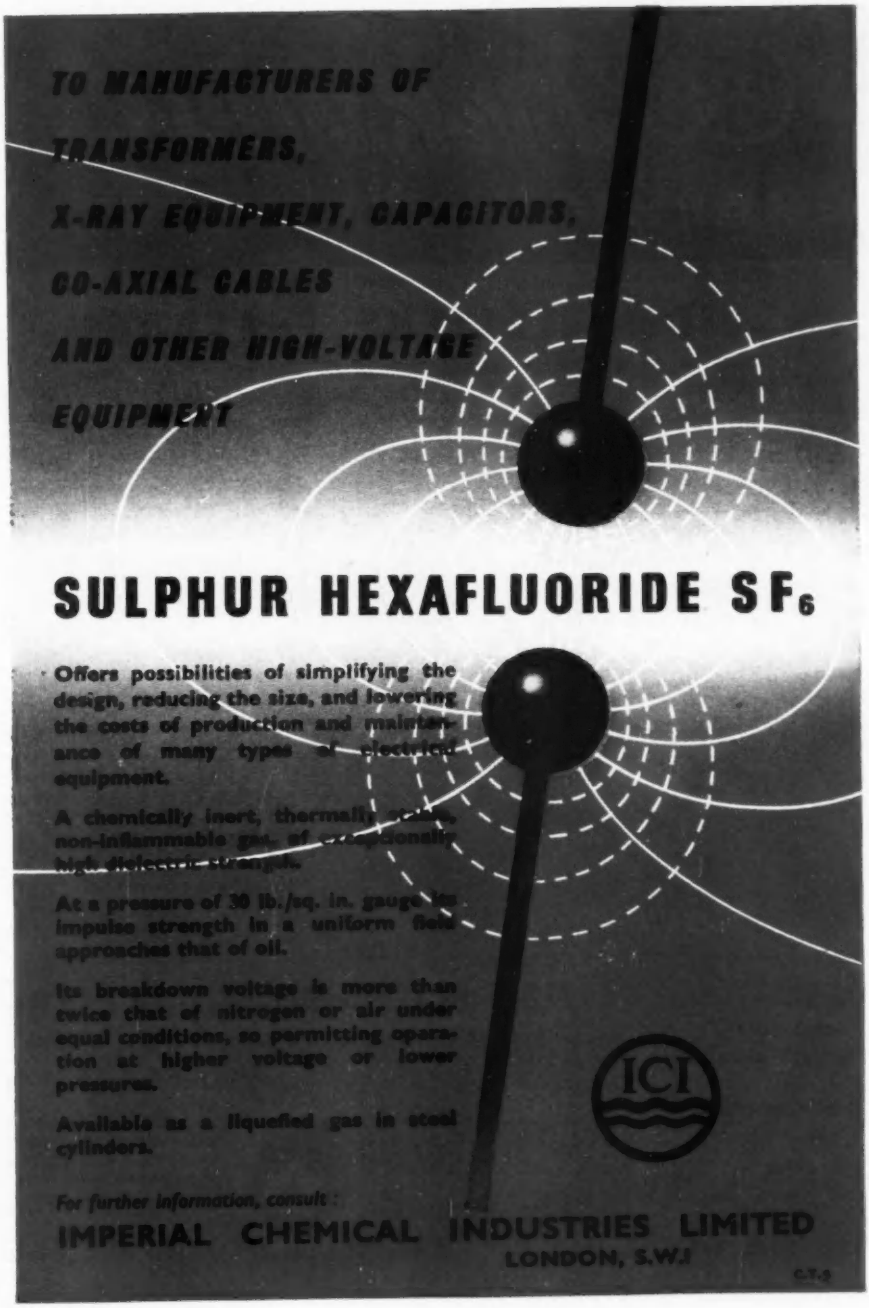
THE THICK AND THIN OF IT

Heavy-duty armoured giants or lissome V.I.R. Cable — there is a General Cable for every ordinary purpose. And when something unusual is needed, then we make a special cable to fulfil the requirements. One thing however *is* constant, and that is the high quality. *All* General Cables are as good as modern machinery, tended by conscientious craftsmen, can make them.

GENERAL CABLES

MADE AT LEATHERHEAD

The General Cable Manufacturing Co. Ltd. Leatherhead, Surrey. 'Phone: Leatherhead 3021/4. 'Grams: "Isolde" Leatherhead. Depots at 204/206 Newhall St., Birmingham. 54a Newton St., Manchester. 55/63 Washington St., Glasgow, C.2


TO MANUFACTURERS OF
TRANSFORMERS,
X-RAY EQUIPMENT, CAPACITORS,
CO-AXIAL CABLES
AND OTHER HIGH-VOLTAGE
EQUIPMENT
SULPHUR HEXAFLUORIDE SF_6
Offers possibilities of simplifying the design, reducing the size, and lowering the costs of production and maintenance of many types of electrical equipment.
A chemically inert, thermally stable, non-inflammable gas of exceptionally high dielectric strength.
At a pressure of 30 lb./sq. in. gauge its impulse strength in a uniform field approaches that of oil.
Its breakdown voltage is more than twice that of nitrogen or air under equal conditions, so permitting operation at higher voltage or lower pressures.
Available as a liquefied gas in steel cylinders.
For further information, consult:
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ICI
C.T.4

"Inkwell"

GRAPHIC INSTRUMENTS

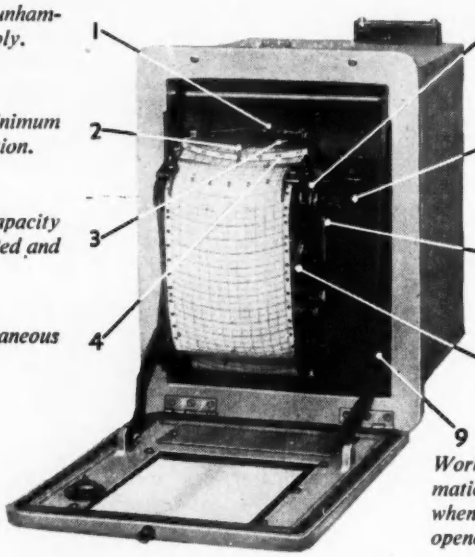
... SOME SALIENT FEATURES

1 *Balanced pen, unhampered by ink supply.*

2 *Syphon pen, minimum pen to paper friction.*

3 *Central, large capacity inkwell, easily filled and cleaned.*

4 *Scale for instantaneous readings.*



5 *Multiple chart speeds, from ½ in. per hour to 12 in. per minute.*

6 *Totally enclosed, high torque movement, magnetically damped.*

7 *Chart mechanism swings open for easy chart renewal.*

8 *Wide range of clockwork and electric chart drives in standard housing.*

9 *Working parts automatically move forward when front cover is opened.*

For best results always use "Inkwell" charts.

•

Speedy deliveries can now be made

• **FLUSH, SWITCHBOARD PATTERN**

A projecting switchboard pattern is also available.

Send for Cat. Sheet 300

EVERETT EDGCUMBE

Makers of electrical instruments for indicating, recording and controlling; photometric apparatus; process controls.

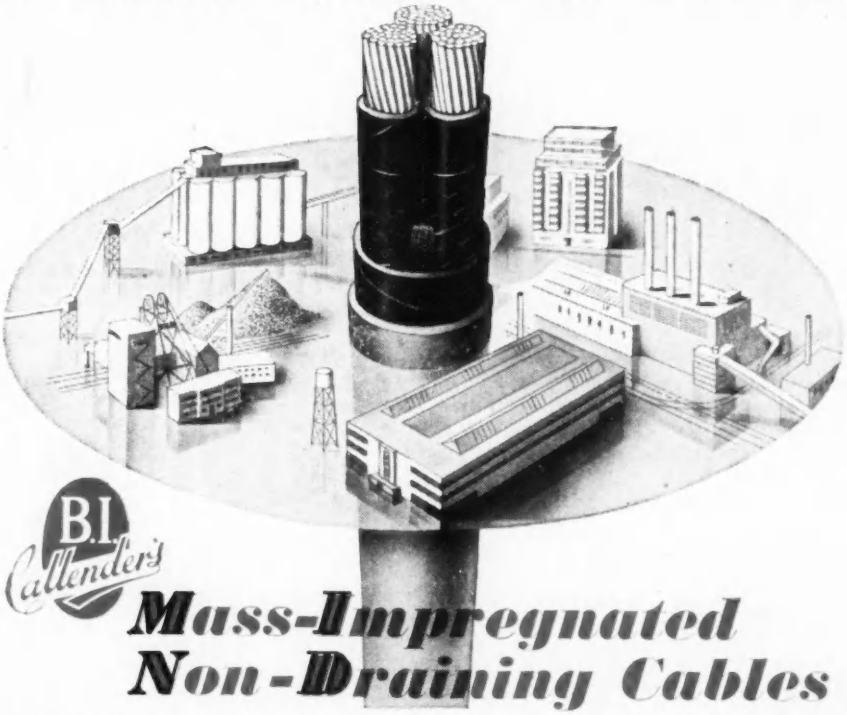
COLINDALE WORKS, LONDON, N.W.9. Tel.: COLINDALE 6045

DHB

new developments

Incorporated in the BICC Mass-Impregnated Non-Draining Cable (Patent No. 581,830) is a special impregnating compound *which will not migrate.* This compound keeps the paper insulation fully and uniformly impregnated, even on vertical runs at the maximum permissible working temperature. Thus the problem of "gummed up" switch and cable boxes and oily patches on the floor is overcome at once. This safe, economical cable can be supplied with all forms of serving or armour to suit different conditions and applications. Mass-Impregnated Non-Draining Cable is made only by BICC and is suitable for factories and mines and also for blocks of offices and flats. For further details write for Publication No. 280V

no compound migration in vertical cable runs



B.I. Callender's

Mass-Impregnated Non-Draining Cables

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

REGISTERED TRADE MARK

SELENIUM
SenTerCel
RECTIFIERS

20kW 400V SenTerCel oil immersed industrial rectifier equipment. Specially sectioned for display at B.I.F. Birmingham 1951.

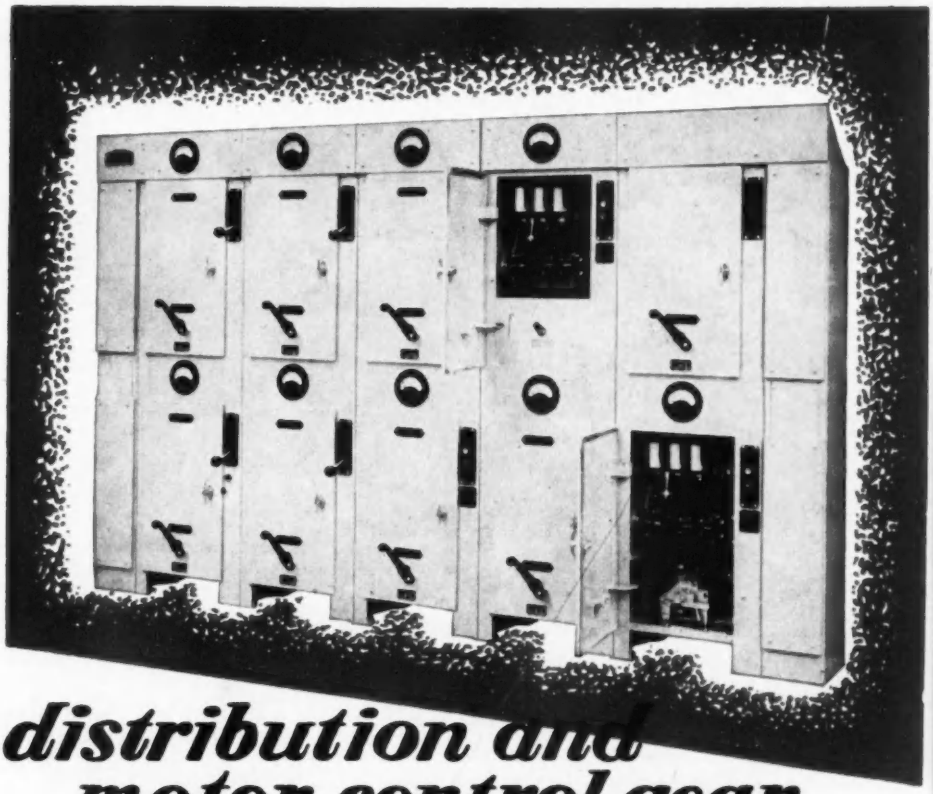
high quality
rectifier equipment
for industry

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, WC2

RECTIFIER DIVISION: Warwick Road, Boreham Wood, Herts.

Telephone: Elstree 2401 Telegrams: Sentercel Borehamwood



distribution and motor control gear

BELMOS

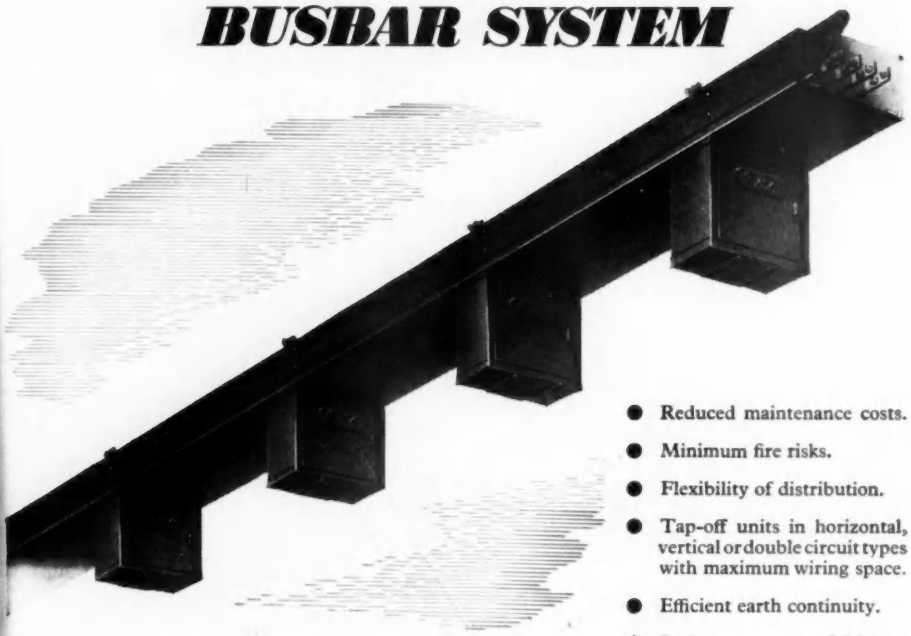
- Totally enclosed in metalclad construction
- Comprehensive interlock and protective features
- Unit construction permitting extensions on site
- Component items of proved ability
- Backed by 30 years' manufacturing experience

The Belmos company limited

BELLSHILL • LANARKSHIRE

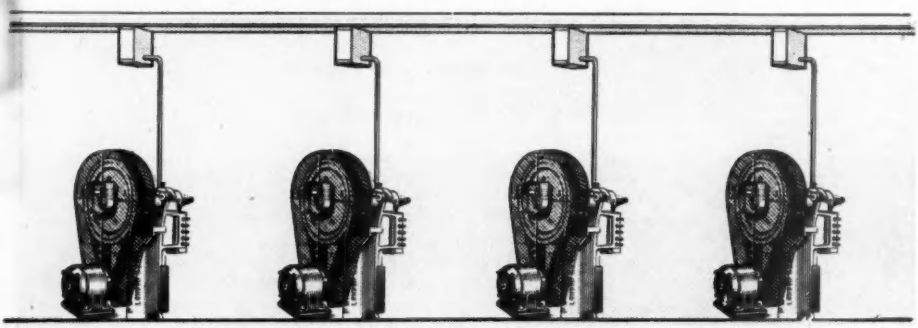
LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH LONDON W.C.2

G.E.C. PLUG-IN BUSBAR SYSTEM



This modern method of power distribution in industry enables power installation layouts to be achieved with minimum labour costs. Installations can be modified or extended to keep pace with developments in the capacity and equipment of the factory without interruption of normal output.

- Reduced maintenance costs.
- Minimum fire risks.
- Flexibility of distribution.
- Tap-off units in horizontal, vertical or double circuit types with maximum wiring space.
- Efficient earth continuity.
- Busbar supports of highest grade porcelain.
- Expansion couplings compensate for temperature variation.
- Minimum voltage drop.



Write for particulars of G.E.C. Industrial Metalclad Distribution Systems

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

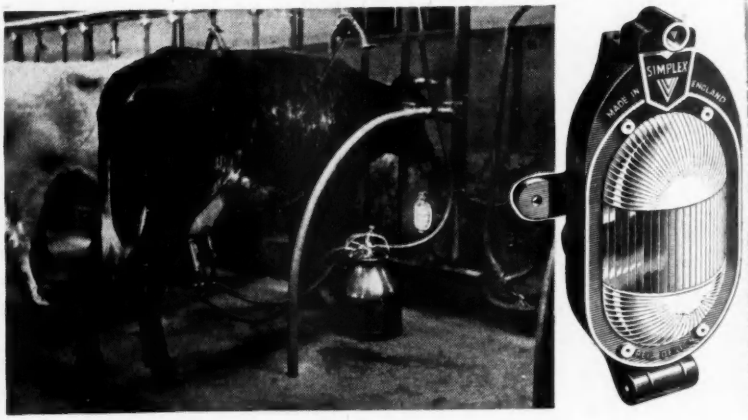
Did Somebody Call?

Another Festive Season is approaching. In the middle distance can be heard the cry of the Lesser Female Bargain-hunter. Soon the ear is assailed by other fearsome sounds; the muttering of the Unpractised Cork-puller, the exclamations of the Annual Knife-sharpener, and the distressed call of the Amateur Electrical Bird, whose plaintive note announces the blow-out of yet another string of coloured lights. As a small contribution to the general spirit of goodwill, good fun and—we hope—good tempers, we hereby announce that a fine prize (the value of which will depend on the state of the petty cash after Christmas) will be awarded to whomsoever of our trade friends first sends us the oldest of our catalogues now available. Let us say now that we are expecting to receive catalogues published in 1919 or 1920, but, who knows, the salvage drive may put a premium on a much later issue.

M. K. ELECTRIC LTD., WAKEFIELD ST., LONDON N.18 Tottenham 5151

A. 49

A light in the cowstall



This ingenious installation helps the cowman with the milking by casting a light where it's wanted. So successful is the experiment that the farmer uses the Simplex low-level lighting exclusively. The Ministry of Agriculture and Fisheries have recommended the idea. This Simplex system, using Simplex Prismax bulkhead fittings is installed at Woolley Park Farm, Bradford-on-Avon. The architects responsible for this installation are Messrs. McDonald & Brown, Unity Street, College Green, Bristol 1, and the electrical installation was carried out by Lambert (Bath) Ltd., of 16 Broad Street, Bath.

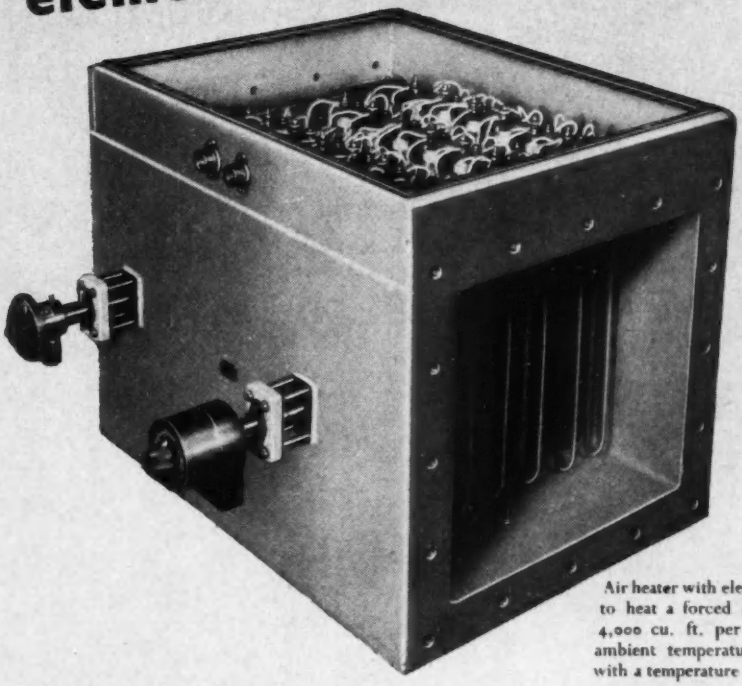
LIGHTING EQUIPMENT MADE BY THE HOUSE OF Simplex

Simplex Electric Company Limited
Oldbury Birmingham and Branches

A TI COMPANY

This is the first of a series of six advertisements on Metrovick Industrial Heating Elements

No element of doubt . . .



Air heater with elements designed to heat a forced air draught of 4,000 cu. ft. per minute at an ambient temperature of 850° F. with a temperature rise of 60° F.

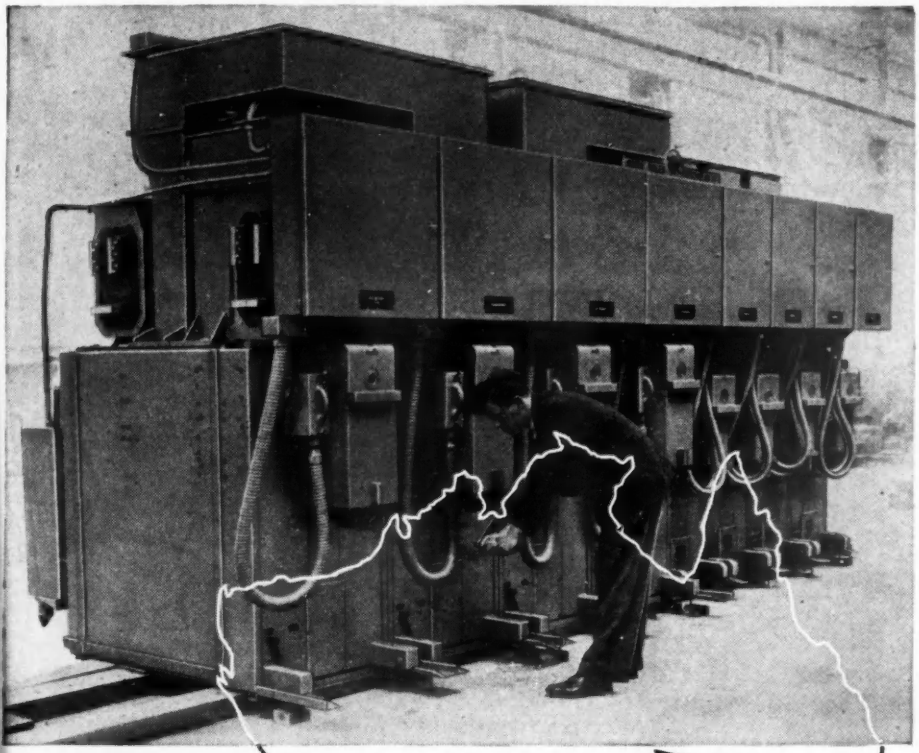
. . . with Metrovick Elements

AIR HEATING

The Metrovick tubular sheathed heating element — as used in the famous "Redrings" for domestic electric cookers — can solve many heating problems in industry. Elements can be supplied suitable for operating in air temperatures of up to 600° C. The construction of the element is such that the outer sheath, which may be supplied in a variety of materials, protects the inner winding from dirt, damp and possibly corrosive conditions, thus ensuring a long trouble-free life under arduous conditions. We can also supply complete air heaters as illustrated. Send for descriptive leaflet 7703/1.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER 17

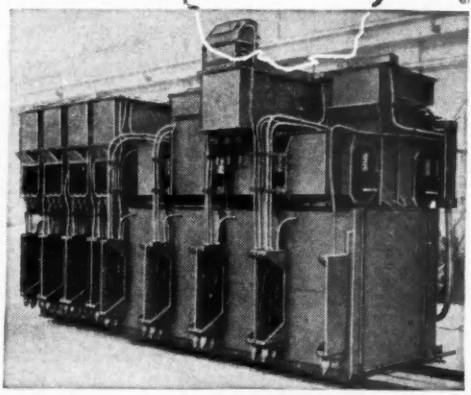
METROVICK *"Redrings" for domestic use*



More SWS equipment for the Commonwealth

SYDNEY

Shown here is the first of six identical sections of a large switchboard made by S.W.S. for the City of Sydney, Australia. The incoming, bus section and bus coupler switches are of 1600 amp. rating, and the 50 panel switchboard is equipped throughout with 2,000 ampere duplicate busbars. The solenoid operated circuit breakers are for 250 MVA. 11kV. service.

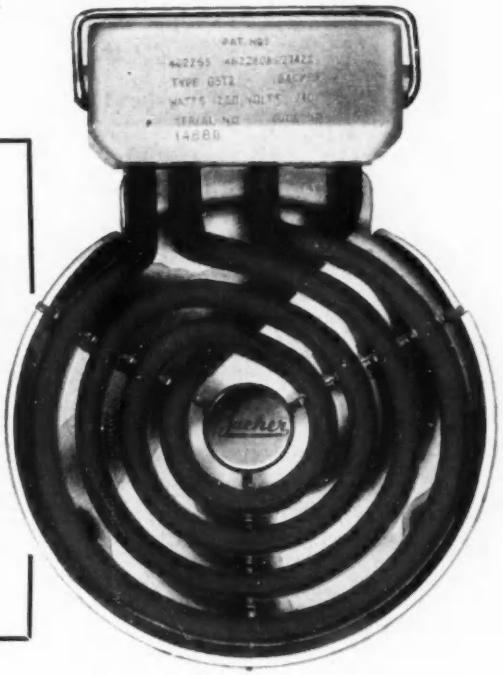


S.W.S

SOUTH WALES SWITCHGEAR LIMITED · BLACKWOOD · MON

ANOTHER OF THE MANY

Backer BOILING PLATES



The 65 T2

This 2-circuit $6\frac{1}{4}$" diameter Radiant Plate is ideal for any size of utensil. With a maximum loading of 1150 watts it is the fastest and most economical plate of its type ever offered. The central tube is confined within a radius of $4\frac{3}{8}$" diameter with a loading of 800 watts, to cater for quick boiling of milk, eggs, etc.

For use on AC or DC supply with 3-heat switch control, or on AC only if fitted with a single or 2-circuit "Simmerstat" or any similar type of control

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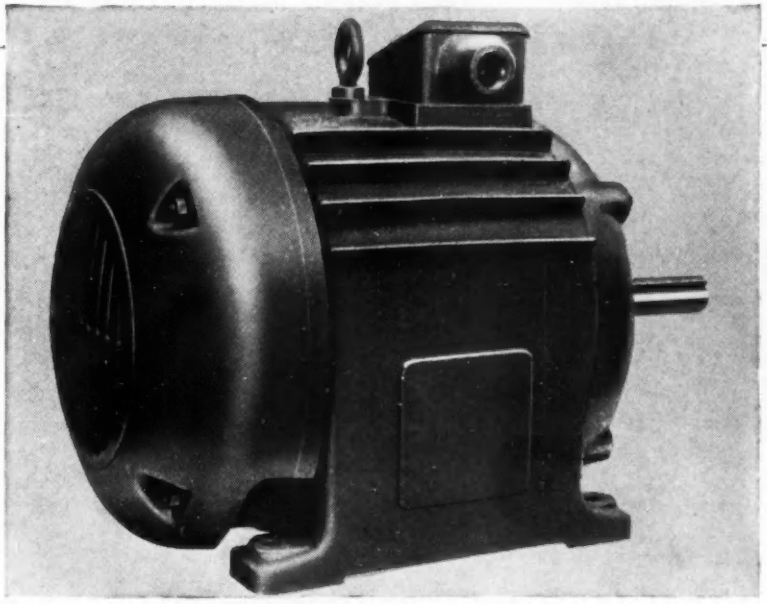

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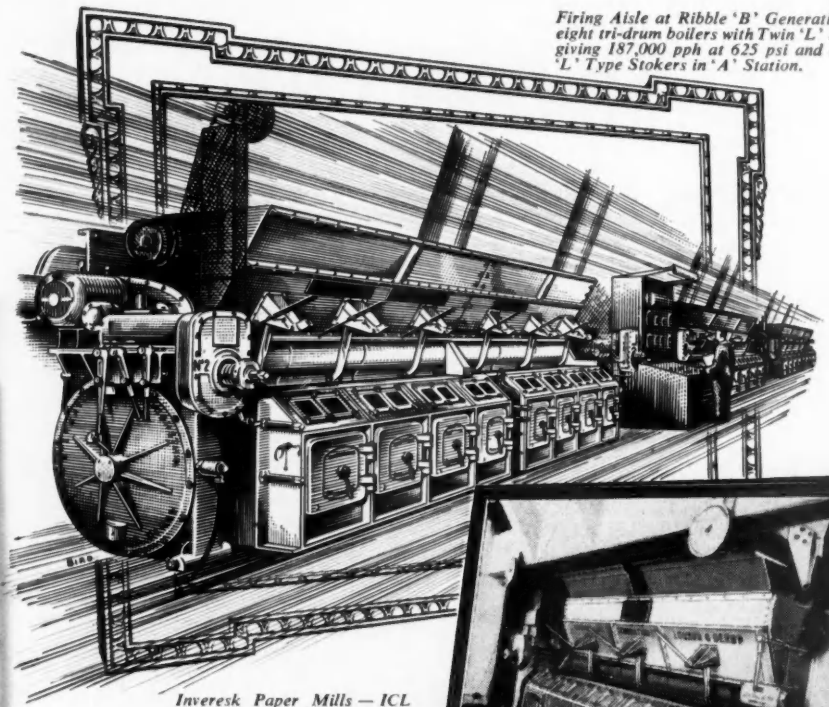

Firing Aisle at Ribble 'B' Generating Station — eight tri-drum boilers with Twin 'L' Stokers, each giving 187,000 pph at 625 psi and 875° F. Four 'L' Type Stokers in 'A' Station.

Inveresk Paper Mills — ICL Stoker 15' 0" wide by 18' 0" long. Two boilers — 40,000 pph normal and 50,000 pph M.C.R. at 330 psi and 750° F. One of the many examples of the 'L' Type Stoker in use at paper mills.

SG 13

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Comparison of the size of the 'L' Stoker installation at Ribble Generating Station with the one at Inveresk Paper Mills reveals the keynote to ICL success. The knowledge and experience gained by ICL technicians in big projects is put to good use in the design of smaller industrial plant. One result is that the economy and efficiency for which ICL steam-raising equipment is noted is available throughout industry.

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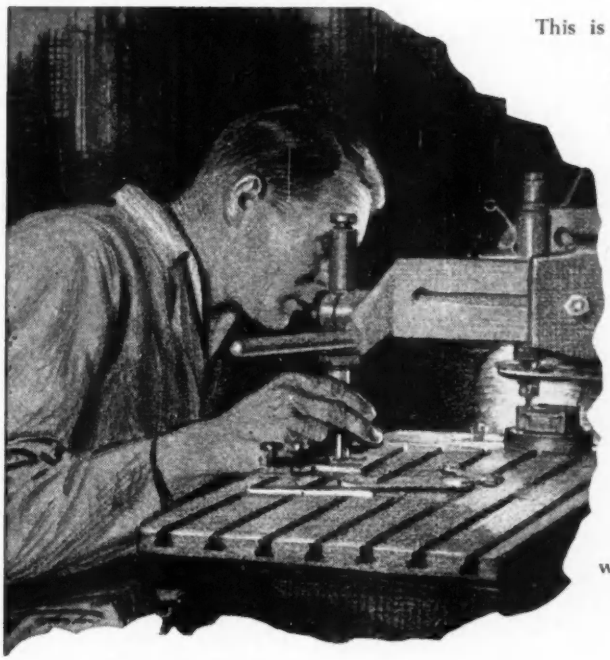

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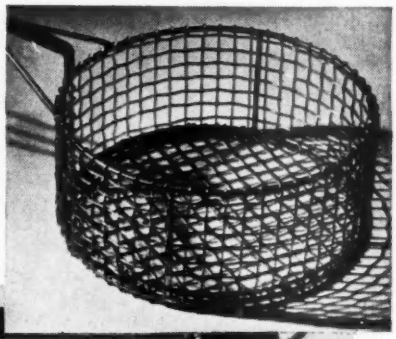

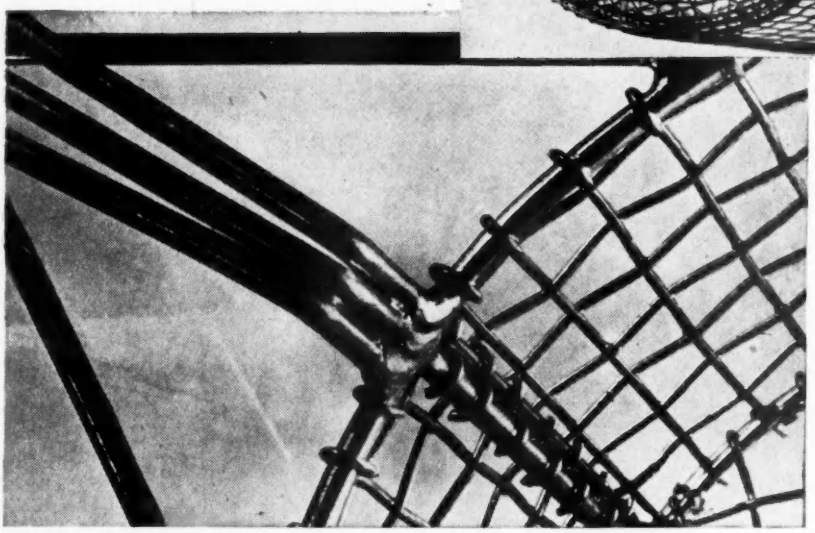

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ELECTRICAL TIMES

Vol. 120 No. 3136 THURSDAY, 13 DECEMBER, 1951

PUBLISHED EVERY THURSDAY

SIXTY-FIRST YEAR OF PUBLICATION

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SUBSCRIPTION RATES.—United Kingdom and Overseas £2 10s. 0d. per annum. Canada C$7·50c., U.S.A. $7·50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies 9d. each.

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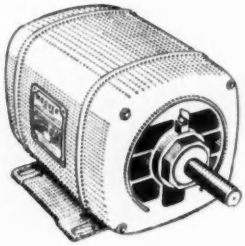

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INDUSTRIAL PRODUCTS DEPARTMENT

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Editorial

PERMIT TO WORK

TOWN and country planning may conceivably make for a more pleasant Britain; in the experience of the electricity supply industry it often seems a refined method of frustrating engineers who want to get on with the job. So the issue, by the re-named Ministry of Housing and Local Government, of a circular laying down revised arrangements for the grant of planning permission to statutory undertakings which "it is hoped . . . will prove simpler and quicker in practice" than existing procedure, is sure of a cautious welcome from the industry. Cautious, because there still seems plenty of complication to bedevil the task of getting started on a generation or transmission project. Schemes are now to be thoroughly discussed with planning authorities before they are crystallised, and these bodies are exhorted to show more appreciation than in the past, of the problems and responsibilities of the organisations requesting permission. Authorisation for overhead lines and for generating stations will still come from the Ministry of Fuel and Power, but arrangements for giving other bodies their say are streamlined as a result of the circular. Probably the best hope of improvement relating to these new methods lies in the spur to be applied on mutual appreciation of difficulties. It is partly as a result of the lack of such a sympathetic approach that the present B.E.A. Welsh hydro-electric bill has had to be promoted.

STATIONS WITHOUT WALLS

SNOW on the turbine casing; ice on the operating floor; hardly practical conditions for operating a power station. In fact, the risk of such a happening would be accepted by many engineers as a sufficient argument against the construction of outdoor type stations in this country. Frequent rainfall in warmer weather would confirm the opinion. Yet information from the United States shows that open stations have indeed operated under such handicaps. Admittedly, not all of the early design features proved sound, and some ideas of working procedure had to be radically revised. But the stations are working, and the saving in manpower and material implied by their principle has apparently been justified. So far the B.E.A. has one experimental semi-outdoor station included in its building programme. No doubt American experience is being closely watched, and it will be interesting to see whether some more ambitious scheme for this country will result from the growing confidence which is apparent across the Atlantic. At these times of high capital costs and stringency in materials supplies, any such development is of first importance.

GASEOUS INSULATION

THE search for new and improved types of dielectrics is never-ending, and in the past few years great attention has been paid to synthetic gaseous insulants. Of these, difluorodichloromethane known as Arcton 6 has been used with success in such high-voltage equipment as Van de Graaf generators and special X-ray equipment. Now a new synthetic gas, with even better electrical characteristics, has become commercially available. This is sulphur hexafluoride and its properties are briefly described on page 1090. Although the application of this gas has, up to the present, been restricted to special equipment working at extremely high voltage, it would appear to have many uses in the more general field of electrical equipment. Admittedly, much research will need to be done before a new gas of this character could be applied to switchgear, transformers and cables; and, as far as the gas itself is concerned, further information is still being sought on toxicity of breakdown products. Nevertheless, this gas,

together with the other synthetic gases, may well lead to a design revolution similar to that brought about by the introduction of plastic insulants earlier in this century.

LESSONS BY POST

CORRESPONDENCE courses as a means of obtaining engineering knowledge, are out of favour with the Institution of Electrical Engineers. Professional engineers must not obtain their theory in this convenient manner, according to present rulings of that body. There was much correspondence in our columns about this a year or so ago, and now the subject has been raised again in a paper presented last week to an ordinary meeting of the Institution; one, that is, at which many of those who matter most in determining Institution policy were present. For workers in the supply industry, said the author, there may be cases where a correspondence course is appropriate, though he thought that this should be backed by full-time periods at a technical college. Speakers in the discussion did not, as a whole, take up this suggestion, though many other ideas in the paper were thoroughly examined. Does this perhaps suggest half-ashamed agreement with the proposal? Certainly the proscription by the I.E.E. of correspondence courses has borne hardly on many deserving students whose work involves shift duties or residence remote from educational centres. While the importance of building up the status of the professional engineer in all ways possible is recognised, the Council of the Institution owes it to potential members to consider carefully if their ruling on home-learning is in the best interests of the profession.

CLEARING THE AIR

ULTRA-VIOLET radiation is well known to have bactericidal properties: that it can kill unpleasant smells is less widely realised. Perhaps because smell, of all the human senses, is the least amenable to definition and scientific investigation, relatively slight progress has been made in producing an agreeable atmosphere when people congregate in crowds, or when some industrial process has a distasteful gas as an unwelcome by-product. Usually reliance is placed on such techniques as forced ventilation, or overpowering the smell by a more acceptable scent. Successful installations which have used discharge lamps to strike more rationally at the essential odourful compounds themselves are described in an Institution of Heating and Ventilating Engineers' paper which we summarise this week, and from *Meteor's* experience of industrial conditions there are many more situations in which such apparatus could, with advantage, be applied. While unfiltered u.v. and the ozone it generates are not without their dangers, these can be guarded against by suitable installation methods. This done, there is available a method of deodorisation that is truly elegant: yet another example of the power of electricity to make life more comfortable.

B.E.A. AND THE LAW

PITY the B.E.A. Do what you will, it gets into trouble. It has now, alleges an M.P., contravened Statutory Order 2596 of 1947. This statement coming as a supplementary during question time, the Minister naturally took shelter behind his well worn right of "wanting notice of that." He may justly congratulate himself on his wisdom. *Meteor*, not recognising the Order, looked it up, a check that showed that the hon. member must have hit upon some subtle secret as 2596 requires that some pathways near the Monmouthshire villages of Cefn-ila and Little Cefn-ila shall be closed. In a charming schedule to the Order paths are listed, one by one, many leading to those twin pillars of British rural life, church and pub. Has Lord Citrine been walking along them, in earnest consultation with Sir Henry and Sir John? Has a cable bridge been thrown to reopen these highways? Might a ladder network provide unauthorised access? Or has the Member become muddled about some reports of birdnesting? Your guess, reader, is as good as *Meteor's*, now that Parliament is in recess. But, you will note, the B.E.A. has been naughty again: and you must wait until the new year to learn just how.

Meteor

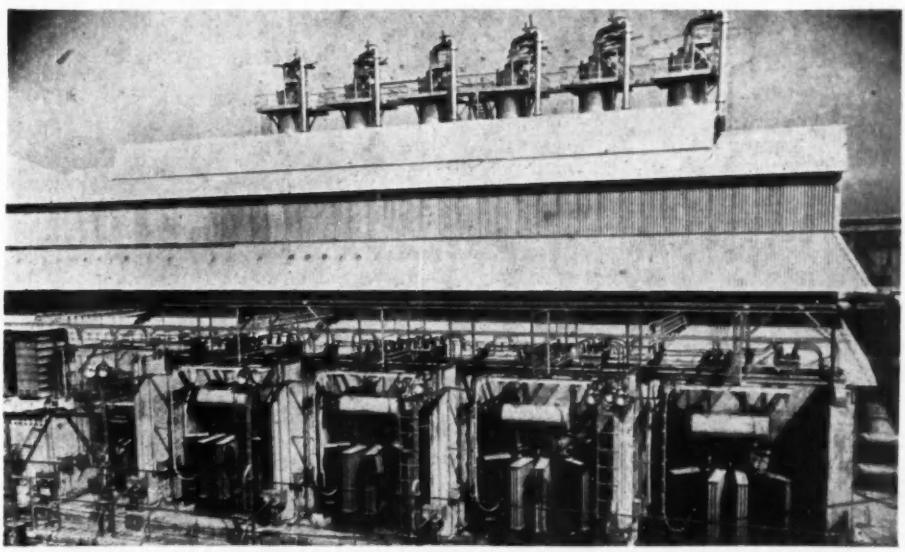
Fertiliser Production in INDIA

Special Generating station supplies 35 MW of Power for operating new Sindri Project; Balance from 80 MW installed capacity feeds Bihar Grid system

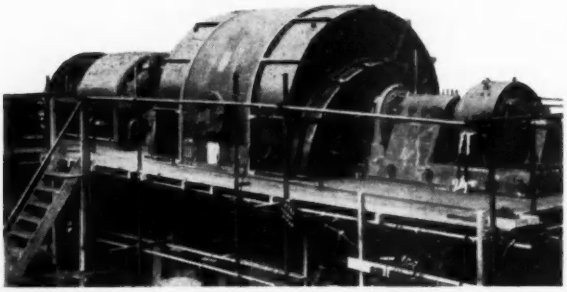
IN 1944, due to the flooding of the Domadar River, a tributary of Hoogley, all rail bridges from Calcutta save one were destroyed, together with all road bridges. At the same time the Japanese had virtual control of the Bay of Bengal, and possessed the large rice-growing areas overseas. As a direct result a famine ensued which caused the death of about four million people in the eastern areas of India, principally in Bengal and Bihar.

Following the termination of hostilities, the Indian Government realised that the supply of basic foodstuffs from overseas was not likely to regain its pre-war volume for a considerable time, and that it would be a great asset if the area could be made, for a time at least, self-supporting in foodstuffs. One essential for this to be accomplished was that there should be a plentiful supply of artificial fertiliser. It was therefore decided to erect a large fertiliser plant on the banks of the Domadar River at Sindri. The Chemical Construction Corporation of New York was appointed as engineers of the scheme, with the Power Gas Corporation Ltd., of Stockton-on-Tees, as agents for the purchase of equipment and for the erection of plant to the designs of the Chemical Construction Corporation. Much of the equipment has been made in this country, although a large proportion has been manufactured in India. The overall cost of the undertaking is about £20 million, and the output will be about 1,000 tons of ammonium sulphate/day, as well as a range of other chemical by-products in considerable quantities.

It has been planned to allow for the output to be doubled with the installation of additional plant. Alternatively, the factory can also be expanded to produce different types of products, such as nitric acid, for India's chemical

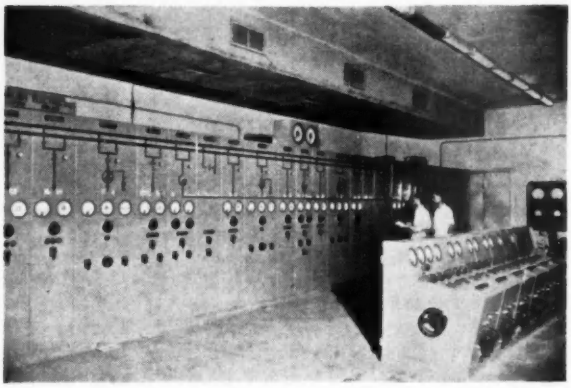


A Type S.2 substation supplied with equipment by English Electric at Sindri Fertiliser Plant



Due to the continuous process system used for fertiliser manufacture, it is anticipated that the factory load will possess a fairly high load factor. The major part of this load is to be taken by English Electric motors, which include four rated at 275 h.p.,

Above is one of the Parsons turbo-alternators on the test bed. Below a view of the control room at Sindri



industry in general, and also quantities of ammonium nitrate or nitro-chalk as fertilisers.

Power Requirements

Sindri lies just outside the Bihar coalfield, and as fertiliser manufacture requires considerable quantities of power, it was decided to erect a generating station which would supply the needs both of the fertiliser works and also the Bihar grid system —a responsibility of the Provincial Government. Process steam is also required in considerable quantities for the chemical works. The station therefore was designed as a combined system, a total plant capacity of 80,000 kW being installed, consisting of four condensing turbines each of 15,000 kW and two non-condensing machines each of 12,500 kW exhausting at a pressure of 25 lb/sq in. gauge. The operating conditions for the turbines are 600 lb/sq in. stop-valve pressure with a steam temperature of 825° F. These conditions are somewhat higher than is normal in Indian practice, and a special dispensation had to be obtained for their utilisation.

The load required by the factory is estimated to be about 35,000 kW and that by the Bihar grid will eventually be 20,000 kW. The remainder of the plant will be required as stand-by, as no other stations will be running in parallel. For use in the factory, the current will be taken direct from the alternators at 11 kV—the generation voltage—but for the outside supply step-up transformers will be used.

The factory electrical distribution is fairly straightforward, as the maximum cable run from the power station is about 1,000 ft. The cables themselves will be run in concrete ducts to the substations, of which there will be one for each building.

seven at 200 h.p., four at 175 h.p., 18 at 150 h.p., six at 125 h.p., and three at 100 h.p. In addition, there are 468 motors of various capacities from 75 h.p. downwards.

All of these motors are for alternating current operation on a three-phase 400 V 50-cycle supply up to 200 h.p., and above this size for three-phase 3,300 V 50-cycle a.c. supply. With the exception of 19 of these motors of the slipring induction type for lifts, cranes and sulphate dryers, all the rest are of the squirrel-cage induction high-torque type, and are arranged for starting direct on to the line. Almost all of the motors are totally enclosed, externally fan cooled, and are fitted with two endshield ball or roller bearings enclosed in dust-proof housings. The windings on each motor are Class B insulated with glass tape, and are double impregnated.

Transformers

Transformers having a total capacity of 90,750 kVA have been supplied to the fertiliser factory project, and consist of six 7,000 kVA transformers having a voltage ratio of 11,000/3,300 V; five 3,000 kVA units with similar voltage ratio, and 27 1,250 kVA units having a voltage ratio of 11,000/400 V.

The transformers are of English Electric three-phase core-type construction, oil-immersed, for outdoor operation. Cooling is effected by means of radiators attached to the periphery of the fabricated sheet-steel tanks in the case of the 7,000 and 3,000 kVA units, and by cooling tubes for the 1,250 kVA units.

To allow for variation of the high voltage supply, off-circuit tappings are provided at $\pm 2\frac{1}{2}\%$ these being controlled by an off-circuit tapping switch. The terminal arrangement consists of 11,000 V outdoor shrouded-type bushings on the h.v. side, and cable boxes for the outgoing leads on the l.v. side of the transformers. Conservator vessels are fitted to limit the effects of oxidation of the oil and to maintain a head of oil within the main tank. A double-float Buchholz device is incorporated to safeguard the transformer windings against the possibility of incipient or major faults during service. The transformers are designed to meet the high temperature conditions existing at the site.

11 kV Substation Equipment

Control of the 11 kV side of the substation transformers is by means of an outdoor isolating switch of the vertical break type and arranged for operation from ground level. Each isolating switch is interlocked with the associated oil circuit-breaker on the main switchboard in order to ensure a correct sequence of operation. The connection between the transformer and isolating switches is made by means of rigid copper conductors of adequate sectional area to withstand through currents during short circuit conditions.

Also accommodated on the above equipment are the current transformers required for the protection of the substation equipment.

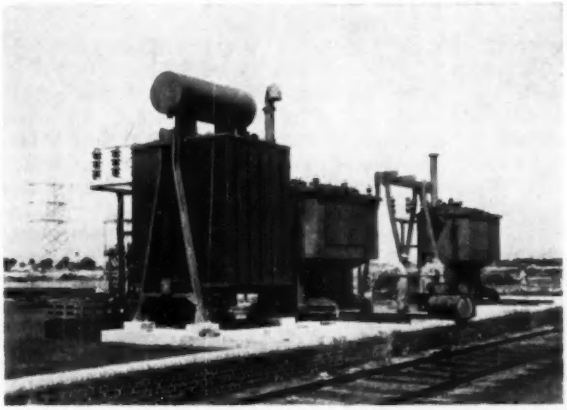
Steam Raising Plant

The main steam raising plant embodies six tri-drum boilers made by Babcock and Wilcox and incorporating "Rotograte" stokers. It may be remembered that in this type of firing the coal is thrown mechanically to the rear of the moving grate, which travels in the opposite direction to that generally adopted, i.e., from the rear to the front of the furnace. As the heavier lumps of coal are flung the furthest, they remain in the furnace for a longer time than the lighter and smaller particles, and thus a proportionate burning time is obtained to give complete combustion.

Each boiler is rated to give 175,000 lb/hr. at 650 lb/sq. in. and 835° F. This installation is a fresh departure in Indian practice and has been adopted due to the quality of the local coal which contains about 18.5% of ash. Disposal of the ash is by a hydraulic system.

Two stage superheating is employed using bare tube superheaters with an interstage attemperator. All normal power-station auxiliaries are included, comprising economisers air heaters, forced, induced and secondary draught fans and cyclonic grit arresters. As the station is electrically isolated, the fans for two of the boilers can be steam driven if necessary, whilst a 400 kW diesel set is installed to provide auxiliary power supplies when required.

Special attention has had to be paid to water treatment plant as the make-up is increased



One of the 10 MVA, 11/132 kV. transformers on the left, and one of the pump stations below

English Electric "OLG" switchgear installed at Sindri

beyond that normally required for power stations practice by the losses in the pass out steam side, and Permutit softening equipment with a capacity of 500,000 lb/hr. has been installed together with a supplementary phosphate-sulphite treatment plant. A special desuperheating station has been set up, to provide process steam at 100 lb/sq. in. for the works use.

Power Station Auxiliaries

For the control of the power station auxiliaries an English Electric 17-panel OB.33 totally enclosed, floor mounted, air insulated, airbreak type switchboard has been installed. This single busbar switchboard is arranged in two sections and interconnected by means of a bus section breaker.

The airbreak circuit-breakers are suitable for use on 3,300 volt, 3-phase, 50 cycles supply system and are arranged for horizontal isolation. The transformer and bus section panels being arranged for solenoid operation and provided with interlocks so arranged as to prevent the bus section circuit-breaker to be closed the same time as the transformer breaker.

400 Volt Switchgear

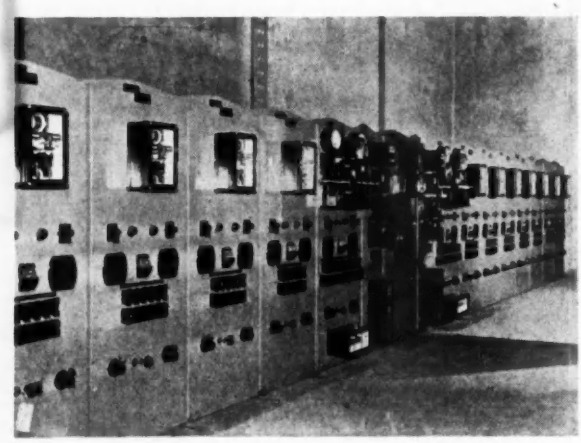
Where 400 volt supplies are required in the power station and the local substations, suitable airbreak switchgear is provided. These equipments are of the totally enclosed, floor mounting, air insulated type provided with our Type OB.3 airbreak circuit-breaker arranged for single busbar service, isolating features on both busbar and cable side of the circuit-breaker, whilst all instruments are mounted on the front of the panels.

Water Problems

Although the station is sited on the banks of a river, it has been decided to use cooling towers for the condenser circulating water due to the demand for raw water in the fertiliser process and the irregularity of flow of the river itself. It is anticipated that considerable civil engineering works will ultimately be required to ensure an ample water supply at all times, as, although, in the rainy season the river is about half a mile wide and 20 to 30 ft. deep at the works site it had also been known virtually to vanish during dry periods. This is due to the porous nature of the river bed. The works requirement of water is about 10 cusecs.

Two schemes are being considered, one using a storage site in a local valley upstream, whilst the other relies on the completion of the Denoda Valley scheme situated some 90 miles above Sindri. At present, water supplies are being brought to the site by canal from up stream where the bed is of rock.

The factory, which is due to be formally opened in the near future, will be one of the largest projects of this nature yet undertaken in India and will radically alter the general agriculture of the area.



Our illustration on the left shows an impressive view of one of the 17-panel OB.33 switchboards

Our readers' views . . .

Demonstrators' Status

ENCOURAGED by the sympathetic approach of your editorial of November 22 on the position of the Housecraft Adviser in the industry, I would like to make the following comment.

Could it be possible that the N.J.C. Agreement is being interpreted and applied in a less generous way than its authors intended? For example: those Housecraft Advisers in the industry who in all modesty can claim to have helped in no small measure to build the domestic load are now relegated to positions which, if so wished, can be considered as unimportant. To women who have spent a quarter of a century in the industry, it is indicated that their experience is of little value.

There are one or two Boards who have shown their appreciation of the long and devoted service of their Housecraft Advisers (by the way, why are some Boards so anxious to avoid this latter title?) and have awarded them a grading adequate to their contribution, but these are few. It cannot, therefore, be said that there is a career for women in the electrical industry since a demonstrator soon reaches a "dead end."

The sense of frustration and hopelessness running throughout can only result in undermining the confidence of the housewife in the service so carefully built up by the skilled demonstrator.

SUTTON *"Still an Enthusiast"*

◆ ◆ ◆

Gas Turbine Locos

I REFER to the letter from Mr. J. Jay printed in your issue of December 6.

The basic factors in the minds of the members of the Cock Committee when they made their last report are set out on pages 13, 14 and 15. Oddly enough there is no particular stress laid on coal economy; they appear to be much more impressed with the prospect of improved flexibility of working. "The economic justification," they say, "must be sought in a reduction of working expenses or an increase in revenue, or both in conjunction, more than sufficient to meet the additional fixed charges."

There is little doubt, however, that probably the most important single national economic consideration at this time is in fact fuel economy. The improvement in flexibility due to electrification is not peculiar to electrification as such. Electric locomotives can give all trains a much higher power to weight ratio, but this could be achieved with other kinds of locomotives. For example, in diesel-electric locomotives in the United States equal flexibility appears to have been achieved by pushing up the power rating. Furthermore the amenity of diesel-electric locomotives in other directions does not appear inferior to electric locomotives taking a supply from power stations.

Before the war the Americans electrified large parts of the Pennsylvania railroad amongst others, and succeeded in obtaining a very large traffic handling increment, but an equally large traffic handling increment could have been obtained with diesel-electric locomotives, and is obviously obtainable with any other kind of locomotive having the same power and flexibility of control. There are a great many detailed improvements in operation and control which would be introduced along with electrification and probably credited to it, but unless these are reviewed apart from the issue of electrification they could lead to a very costly error in economic strategy.

It is well to review one or two basic facts on this matter. Diesel-electrification is strategically inadmissible. The energy for electrified working would presumably come from the British Grid System. This system at the moment has a weighted thermal efficiency of the order of 21-22%, and with new power stations coming into operation and projected the system may have in 20 years time an average efficiency of, say, 26-27%. Inevitably it could not on present plans be much higher because of the very large amount of old plant still likely to be running in 20-30 years time. On the basis of electrification today, however, and allowing for the inevitable losses in substations, overhead lines and control gear within the locomotive, it is doubtful whether the energy would be delivered to the drawbar at a figure of better than 14%. In this connection it may be recollected that the transmission losses in a diesel electric locomotive are of the order of 20% at best efficiency.

There are no very reliable data on the integrated drawbar efficiency of steam locomotives on their ordinary day-to-day running.

The very high grade (14,000 B.T.Us./lb) coal consumed under trial conditions seems to vary between 3 lb and 4 lb per drawbar h.p.-hour. Taking the matter all round, it certainly would not be reasonable to assume a drawbar efficiency of better than 5%. This means that, provided there was no increase in rail traffic or the speed at which it was likely to be hauled, then the saving by electrification would be some 60% of the present railway consumption of some 15 million tons p.a., i.e. 9 million tons.

Complete electrification of the remainder of the British railway system would apparently cost the best part of £1,000 million, although the figure is very difficult even for the experts to estimate because of the unstable value of the labour required to win the coal as against the labour and material which would be required to electrify the railways. Broadly speaking, however, the proposal would in effect be to invest £1,000 million to save 9 million tons of coal p.a., a great deal of the saving being consumed by increases of traffic and speed of hauling. This latter point applies equally to acceptable alternatives capable of giving the country greater volume and speed of heavy transport.

Mr. Jay is apparently in favour of electrification, and in view of the threat (as he seems to see it) of a successful gas turbine locomotive burning coal, he is suggesting partial electrification. His partial electrification would however be relatively as bad (or as good) an economic solution to the problem as wholesale electrification. If part electrification is justified the probability is that whole electrification is justified, in spite of the fact that the long runs have at the moment relatively less dense traffic. So that as I see it either it is correct to electrify the British railway system on the lines of the last report of the Cock Committee, or it is correct to develop a coal-burning locomotive equivalent in flexibility and power to an electric locomotive, and one which in the aggregate uses as little or even less coal than would be the case with electrified working, which must obviously be via the power stations of the British Electricity Authority. Also there is no reason why a self-contained locomotive, even one using coal, should not be as clean, as flexible in operation, and as pleasing to the eye as an electric locomotive; the diesel-electric locomotives used in the United States look even more pleasing to the eye than many electric locomotives. If that is all that matters it seems to me that the real question is whether £1,000 million of capital can be spent more effectively by pursuing the at least 50 years old idea of railway electrification (outmoded now in the United States), or of saving the same amount of coal by a much smaller capital investment in other directions, such as more efficient use of coal in industry, the combination of production of power with district and process heating, or the development of the new kinds of loco prime mover described by Dr. Roxbee Cox in his lecture.

There can be no doubt, on the basis of the claims made of efficiencies between 10% and 19% depending on the load, that such locomotives would save very much more coal than railway electrification on the basis of the present efficiency of British steam power stations, and that on Dr. Roxbee Cox's figures he would still at least break even with what is likely to happen if the energy were derived from condensing steam power stations of existing types over the next 20 to 30 years.

Further, the capital cost strictly chargeable to this improvement in coal economy would be vastly less than for electrification, and the saving could start immediately. All the locomotives used at the moment in this country on long distance heavy continuous running could be replaced first and nine-tenths of the fuel economy benefit of this new machine could easily be secured within 10 years of its successful development.

I hope to see in due course an even more efficient gas turbine locomotive than that proposed by Dr. Roxbee Cox, also using coal and working on a somewhat different thermodynamic principle, but it is not the purpose of my letter at this time to draw attention to that, nor is my purpose to defend Dr. Roxbee Cox since he is perfectly capable of defending himself. The economic argument in favour of experimenting on the lines suggested by Dr. Roxbee Cox is quite overwhelming vis-à-vis the expensive and not very inspiring prospect of electrification. It is most significant that the Railway Executive have concurred in the building of this experimental loco. Electrical transmission of mechanical energy has very definite limitations in a country where the bulk of the energy must necessarily come from fuel-burning prime movers. Stepping up the unit size of such prime movers, with inevitable extensive increase in transmission distance, is not a scientific approach to this problem. The problem of Britain is utterly different from that of, say, Switzerland, where long distance electrical transmission is the inevitable consequence of a water power economy.

EDINBURGH *J. F. Field*

Technical College Training

New Courses advocated in I.E.E. Paper

SPECIAL courses of Higher National Certificate standard, suitable for technicians engaged in the manufacturing and electricity supply industries, were advocated by Dr. H. L. HASLEGRAVE, wh.sc., M.A., PH.D., M.SC.(ENG.), M.I.Mech.E., M.I.E.E., in a paper on technical colleges which he read at an Ordinary Meeting of the I.E.E. on Thursday last. The greater part of the paper is devoted to a review of existing facilities, with suggestions for improvements, but detailed ideas for the proposed College of Technologists awards and for this technician's qualification are also developed.

For technicians in manufacturing industry, it is suggested that O.N.C. in electrical engineering gives the desired basis. Following this, a two-year course should be offered, the subjects being electrical principles and technology and workshop principles and technology (compulsory), and either electrical machines, drawing and design (for draughtsmen) or electrical laboratory (for testers and outside erection engineers). For preference, the course should be of the one-day-a-week type, and instruction in English should be included.

Supply Industry Courses

So far as the supply industry is concerned (and the same considerations apply in some degree to telecommunications undertakings) the need is less clearly defined, and the technicians spread more thinly over the country. Assuming again a basis of O.N.C., a suitable course might have electrical principles and technology, and electrical generation, transmission and distribution as compulsory subjects, with one further optional study. The choice here should lie between instruments, switchgear and control systems; transmission and distribution; and mechanical technology. Though the one-day-a-week course for two years would be suitable, there would probably be a considerable need for a sandwich type of course. Endorsement courses in specialist items would be necessary. In all of this correspondence tuition had its part to play.

Now that the Institution of Technologists scheme has been adopted in principle, Dr. Haslegrave suggests that a new type of course may be developed to match it, the technical training being biased towards practical applications and towards actually doing things and seeing production carried out. Such a policy involves giving the engineer at college only the technical knowledge he is likely to require in, say, the first five years of his career, but at the same time providing him with a sound basic training, and arranging for post-graduate courses of many types to be available to him at later stages in his career. It will be necessary to seek the help of executives in industry who will employ the engineers, at the stage when the syllabus is drawn up.

Examinations

Examinations for such a course would be set by the staff of each technical college, with an external assessor for the final papers of each college. In addition, however, to sitting for orthodox examinations, students should also be required to undertake some practical project, which would test the learning acquired during the course.

Many other topics are covered in the paper, but it is only possible here to summarise them in recommendation form. Firstly, the author stresses that facilities for the corporate community life of a technical college should be good, and that adequate time and stimulus should be given to students to engage in social and athletic activities. Turning to the more academic details, it is recommended that technical colleges should not normally provide courses preparing students for an engineering degree; however, certain technical colleges should organise post-graduate part-time or full-time courses in specialised engineering subjects. Research and investigation should be carried on in technical colleges whenever conditions permit.

For craftsmen, technical colleges should provide post-final C. and G. courses, while for technicians either courses of the type described above should be offered, or else C. and G. courses of a new type, involving attendance on two nights a week for two years, or one day every fourth week for three years.

Before the author read his paper, Sir Arthur Fleming paid tribute to the memory of

Professor Silvanus Thompson, whose centenary fell this year. He recalled him as a man always immaculate in appearance, never ruffled, who to start with, inspired awe rather than affection in the students; affection came later. He was, however, a man of the most kindly nature and had many gifts. He left behind him no record of great discoveries, but as a teacher he had few equals; his lectures were lucid and entrancing. He insisted throughout his life on the importance of the closest collaboration between industry and science.

DISCUSSION

MR. J. C. JONES (Regent Street Polytechnic), who opened the discussion, agreed that the technical colleges had failed to recognise the existence of the technicians in industry, and said that in the past technicians had been recruited from two main sources: the craft student who had made good and the professional student who had not. He was glad that the author proposed a modified form of H.N.C. course to meet the needs of technicians, but he would have liked the composite scheme to embrace also the craftsman.

MR. H. E. DANCE (Ministry of Education) said that the tempo of the development of the schemes outlined in the paper would depend on the rate at which the physical provision for them could be made. There were many simple changes, however, which could take place in technical colleges without delay in order to improve conditions such as reducing the multiplicity of similar courses. He welcomed the suggestion that colleges should make less provision for degree courses. The nationalisation of industries had concentrated attention on the plight of scattered apprentices for whom there was no local provision, and this could be and was being dealt with by moving them to places where courses could be provided. For this purpose hostels were necessary.

Several other speakers covered particular aspects of educational policy, including comparisons with America, the needs of the B.E.A., sandwich systems and day release and the need for training in economic matters. The employers' attitude was also dealt with.

The Author, replying to the discussion, confessed that he was very worried by the tendency to appoint in technical colleges staff with little industrial experience.

Board and Contractors Confer

IN October, 1949, a liaison committee was formed between the E.C.A. and the South Wales Electricity Board to maintain the fullest co-operation between the two organisations. Evidence of its success in maintaining friendly feeling in the area was plentiful at the second Joint Conference and Dinner, arranged by the Committee and held in Cardiff on Thursday last.

Some 120 delegates attended the Conference, these coming almost equally from board and contractors, and there was a good gathering in the board's showrooms when the morning session was opened by Mr. L. Howles, C.B.E., chairman of the Board. After Mr. Howles' remarks, a paper was read by Mr. W. J. Shaw, Chief Engineer, Broadcast and Television Section of the G.E.C. He spoke on television service and interference suppression, supporting his talk by demonstrations. In the afternoon, two more papers were presented, the first coming from Major A. G. J. Davy, an E.C.A. member, and dealing with installation practice with particular reference to modern wiring systems and modern trends in plant and equipment.

The final paper was a joint compilation of Mr. J. W. Bird, M.B.E., chief engineer of the Board, and Mr. J. F. Smith, the chief commercial officer.

After the Conference a dinner was held at the Royal Hotel Cardiff, under the chairmanship of Mr. Howles. His toast of "The Guests" was replied to by Mr. A. F. Plummer, a vice-president of the E.C.A. Following the speeches, the successful day was brought to a close by the showing of a C.o.I. film : "River to Cross."

Mr. Howles opening the conference, supported on the stage by Mr. R. L. Book, Chairman of the E.C.A., South Wales Section

Notes on Wiring
by MEGOHM

Old and New Methods

Reflections on the Building Exhibition

AT the Building Exhibition in London I saw some old and new methods of interest to electrical contractors. On the British Electrical Development Association's stand was displayed a typical installation for a small house in the carcase stage. From the consumers house service and control unit the wiring was installed in separate conduit systems for lighting, socket outlets on a ring circuit, cooking and water heating, each conduit system being differently coloured for ease of identification.

Paint Needed

The conduit systems were in light-gauge conduit with lug grip conduit boxes on all the systems except the cooking service which was carried out in heavy gauge screwed welded conduit. I wonder why? I noticed that the ends of the conduits entering the lug grip fittings were well cleaned and left bright. I hope visitors to the Exhibition will not think this is the correct way to complete an installation. The exposed bright surfaces on the steel conduits should have been well painted to prevent rusting, otherwise it is possible that high-resistance joints would soon develop in the conduit system. It is obvious that it is difficult to properly paint the exposed clean metal surfaces of the conduit between the lug grip clamps, which is a bad feature of this particular type of wiring system, and in view of the shortage of steel today, one would have thought an insulated wiring system would have been used.

Fuel and Lagging

The method of installation and pipe work for hot water services in a small house were clearly shown and the heat wastage by imperfect lagging of the hot water storage tank prominently displayed. The heat loss on a 30-gallon hot water storage tank is given as equal to 342 gallons of hot water when the tank is unlagged, 76 gallons with 1 in. thickness of lagging material, and 27 gallons with a 3 in. thickness of lagging material. This is an important point to remember, and the reason sometimes put forward for using an unlagged tank in the linen cupboard should be strenuously opposed, since it is far better and economical to install a small air heater for airing clothes than to try to do this with an unlagged hot water storage tank which dissipates heat quickly, resulting in high running costs.

Leaving the E.D.A. stand, my attention was drawn to two developments. The first exhibit a method of forming ducts in the concrete screed of hollow pot-tiled floors. A heavy rubber tube, available in 60 ft lengths, is used and laid on the pot floors from point to point and point to switch drop, following the general lines of a "looping in" conduit system. After the rubber tubing is laid out it is inflated, the concrete screed poured, and when the screed has set, the rubber tubing is deflated and withdrawn. When wiring, an earth continuity conductor may be drawn into the ducts with the insulated cables for connection to the earth pin of sockets and non-carrying current metal work.

Effective Firing

The second exhibit, an impact gun for shooting fastenings into steel, concrete and brickwork, reminded me that some three years ago I was in contact with manufacturers in the U.S.A. on the possibility of using such a gun here, but difficulties arose and the matter was shelved. Readers will no doubt have also noted recent reference in other columns in the ELECTRICAL TIMES to the use of such a gun. The demonstration on the stand was impressive, and the shooting of metal threads into channel iron, leaving the thread undamaged, should prove of great value in the fixing of conduits, cables and equipment to steel work. This, of course, also applies to fixing in hard concrete, where considerable labour saving should be gained by the use of the gun.

I was advised that the Home Office does not classify the gun as a firearm and it is impossible to discharge unless it is in contact with a solid surface. The gun requires three definite operations when in contact with a solid surface before it can be discharged. These operations are in sequence and are carried out in a few seconds and, therefore, do not materially delay firing the gun.

Golden Jubilee of Radio

FIFTY years ago last Wednesday, December 12, Guglielmo Marconi wrote in his diary, "Sigs. at 12.30, 1.10 and 2.20," for, at those times on that day he had heard the letter S in the Morse Code and knew that, on the other side of the Atlantic, his colleagues had been responsible for transmitting those signals. Wireless communication had been established, between the Old and New Worlds.

Before this success Marconi had already founded the present-day Marconi's Wireless Telegraph Co. Ltd., and, by 1900 he had been joined by the first of a long line of colleagues and engineers. With two of these (Kemp and Paget) he went to Newfoundland, confident that they would receive wireless signals from the Marconi station at Poldhu, Cornwall, and this confidence never weakened despite the scepticism of contemporary scientists and engineers. He knew that four years earlier, when only twenty-one, he had also faced disbelief when he told the British authorities that he could pass intelligence through the air without wires. Although public opinion was unconvinced the authorities realised that this young man had been following the paths marked out by Henrich Hertz, Clark Maxwell and other exponents of electromagnetic theory and, after hearing him and allowing him to demonstrate his apparatus, they offered every encouragement in this field to the young scientist.

The first wireless patent was filed in 1896 and in 1897 the Marconi's Wireless Telegraph and Signal Co. Ltd. was formed. The Navy ordered equipment and their example was quickly followed by other authorities. Until 1901, however, the range of these wireless signals had extended but slowly, and many eminent scientists, while accepting the invention, were of the opinion that the range would always be too limited to prove of universal benefit.

In 1898 wireless was used in Naval manoeuvres over distances up to 74 miles and the South African war saw the advent of military wireless communication. The name of the Company was changed to its present form in 1900, and, at that time a new station site was being sought. With an Atlantic signal crossing in mind this site was chosen high on the cliffs at Poldhu near Mullion, and construction work began.

A Great Advance

To that date all wireless experiments had been carried out by the Company on scales which (Marconi realised) would not be large enough to attempt this great experiment.

A transmitter over a hundred times more powerful than anything previously attempted would be needed. About 25 kW was the power aimed at—an unheard of output in the small world of wireless in 1900.

Design of the transmitter was immediately undertaken. Acting as scientific advisor to Marconi was Prof. J. A. Fleming, F.R.S., who was to be known, all over the world, in later years as Sir Ambrose Fleming, inventor of the thermionic valve.

Early tests between Poldhu and Crookhaven (on the west coast of Ireland) showed that strong signals could be passed over the 225-mile stretch and this encouraged the workers at Poldhu. An aerial system for transatlantic signals had been devised. It was to be an inverted cone of wires supported by twenty 200 ft masts in a circle of 200 ft diameter. The transmitter buildings were to be sited in the middle of the circle. Within a few days of the completion of the aerial a heavy ocean gale completely wrecked all the masts and another aerial array had to be constructed. The work had taken a long time, and it was felt that the attempt should go on as quickly as possible, so a simpler aerial array was erected. This was a fan-shaped array suspended between two 150 ft masts.

Poldhu was ready and a suitable receiving point, on the other side of the ocean, was needed. Newfoundland, nearest point to Britain, was chosen and on November 27, 1901, Marconi, Kemp and Paget sailed on the S.S. *Sardinian*. They arrived in Newfoundland on December 5.

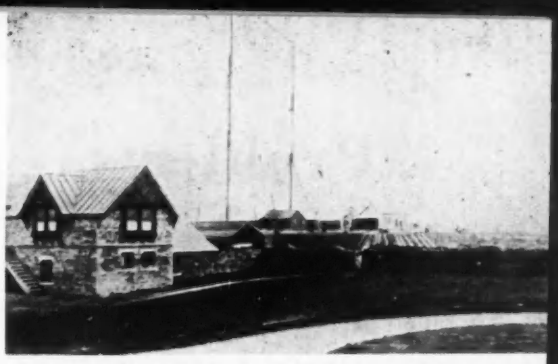
Every available facility was provided for them by the Governor of the island, Sir Cavendish Boyle, and the Prime Minister, Sir Robert Bond. The receiving station was set up in a room of the Barracks Hospital, on Signal Hill, St. Johns.

In order to elevate the extremely long aerial to be used at Signal Hill, a balloon was used in the first place, but it was at once carried away by a strong wind. On the next day, Thursday, December 12, an aerial wire 500 ft long was raised on a kite. Within an hour the wind had also carried this away. Another kite was tried and, to the workers' relief, it held.

All that remained was to wait for signals. . . .

Times of sending had been pre-arranged, and at the appropriate time Marconi himself listened out. It was 12.30 p.m. when, after a wait so tense that the men on Signal Hill must have been almost nervous wrecks, Marconi handed the earphone to Kemp, asking him whether he could hear anything. Kemp heard the cacophony of atmospheric crashes . . . he also heard what Marconi had heard . . . three dots forming the letter S.

Later that day Marconi wrote in his diary: "Sigs. at 12.30 . . .": a new era in the world of communications had begun.



(Above) The 150-ft masts at Poldhu used for the first experiments and Marconi with Kemp (left) and Paget (right) at Signal Hill, Newfoundland. (Below) Preparing the kite in Newfoundland, and at the bottom is some of the early equipment at Poldhu

Problems and Practice

IN ENGINEERING

Fan Vibration

A 15-h.p. primary air fan motor on a pulverised coal plant had the impellor keyed directly on to the motor shaft, which extended into the fan casing. Trouble from excessive vibration was experienced from its installation, and worsened as the impellor became unbalanced due to uneven wear of the blades caused through the abrasive action of the pulverised coal.

Frequent stoppages often occurred due to broken motor feet bolts, badly worn ball and roller bearings, bearings loose in housings, fractured motor end plates, and all this accompanied with considerable noise. After each repair, attempts were made to balance the impellor, but the faults recurred, the cause being undoubtedly due to the heavy impellor, unsupported by a bearing, on the extreme end of the motor shaft, setting up vibrations.

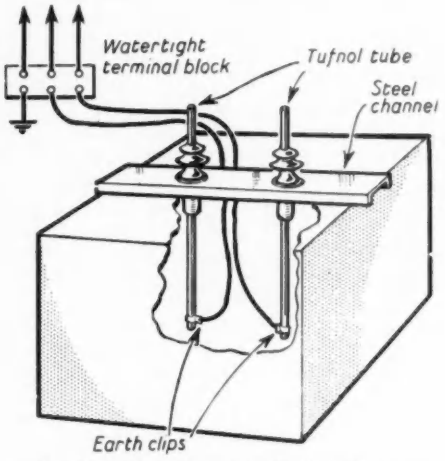
It was found possible to move the motor $1\frac{1}{2}$ in. along its fabricated pedestal towards the fan casing, and by lengthening the keyway in the motor shaft move the impellor that amount along the shaft towards the motor bearing. It was also observed that the impellor had not been running directly central in its casing, and that a further $\frac{3}{4}$ in. could be obtained (making $2\frac{1}{4}$ in.) in moving the impellor towards the motor bearing. The motor pedestal, which was also fractured, was welded and additional bracing added.

These modifications, though not completely eliminating all vibration, have improved the condition considerably and the fan has now been running for 12 months without a failure, running less noisily than formerly. The out of balance through worn blades do not affect the running as much as was suspected would be the case.—*T. H. Snelson.*

Liquid Level Controls

INSTALLING liquid level control systems often presents difficulties, especially where contact probes are used for hot water. Steam condensation, together with a smoky atmosphere, soon leads to complete failure of the sensitive relays to control correctly. The case in question being a hot water header tank, open to the weather and surrounding atmosphere, gave considerable trouble, i.e., overflowing and wrong level indications due to tracking between insulators and earth when moist.

The following remedy was applied with great success: The existing metal rod electrodes were removed from the condenser-type bushings, and Tufnol tube of the same length and diameter inserted in their place.



Detail of electrode system for liquid level control in water tank

To the extreme tips of each tube was clamped an earth clip, and a plastic insulated conductor attached, leading out to a watertight connector block.

After nearly two years of use without failure, it is interesting to note that the insulation of the immersed conductors shows no deterioration, and that the hollow electrodes are self-drying when not actually immersed, due to residual warmth.—*Bernard O. Julier.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Progress in Queensland

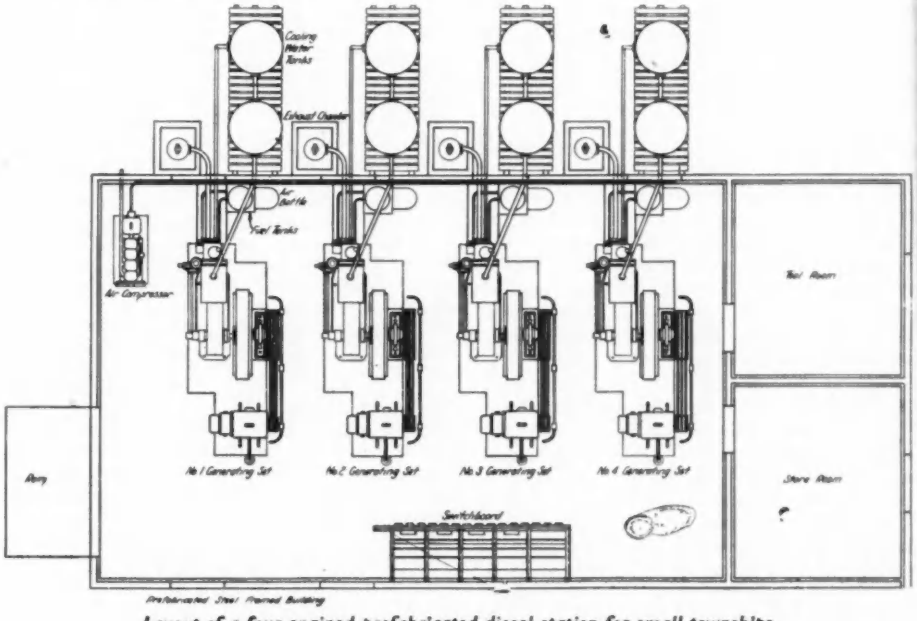
Programmes jeopardised by Copper shortage

A SERIOUS situation in Queensland (Australia) due to copper and steel shortage is envisaged in the 14th Annual Report of the State Electricity Commission, covering the period June 1950 to June 1951. In the general review of the situation it is stated that the electrical development of the State has proceeded during the year at a rate which must be regarded as satisfactory having regard to the rate at which materials and equipment are coming to hand. However, for certain essential items such as steel and copper, the supply position is now worse than it has ever been, and unless the electricity supply industry is granted the highest possible priority, and materials in short supply specifically allocated to the industry, it may well be that severe power shortages will occur in the future and further electrical development be brought to a standstill.

Financial Situation

The economics of the industry are also being seriously affected by rising costs and unless there is a halt to these, it will be impossible to maintain electricity supply tariffs even at their present levels. The estimated cost of works in hand or scheduled for commencement in the current year by public electric authorities totals £29,827,964, and during the past year £3,932,535 was expended on the programme. In the current year the expenditure programmed as necessary to maintain the desired rate of progress amounts to £9,739,390.

An assessment of the financial position of the whole area is difficult, as there exist numerous small undertakings working under very different conditions. Taking, however, the overall totals, units sold amounted to 664·3 million for a production cost of nearly £5 million. Cost per unit generated was 1·429d., and cost per unit sold 1·733d. These are, of course, averages; in one case the cost of production was as high as 17·306d. with a similar selling price. At the other end of the scale was a generating cost of 1·325d./unit with a corresponding selling price of 1·48d./unit. The overall profit (out of which income tax and dividends have to be paid) is £107,743 and the total assets amount to £23·6 million.



Layout of a four-engined prefabricated diesel station for small townships

New Plant

Extensions in progress at Brisbane include three 30,000 kW turbo-alternators, which have been delivered and are lying in store, and further units are on order. Progress is, however, held up due to delays in building construction. The present overall installed capacity in S.E. Queensland is 170,000 kW and it is hoped that by the end of 1952 this will be increased to 193,200 kW by the installation of two 10,000 kW "packaged" installed and the 3,200 kW hydro set at Somerset Dam. Eight 30 MW sets are envisaged for installation at Bulima "B" and will be required by 1958. After that the rate of increase is expected to be somewhat greater than 30 MW/annum and consideration will be given to larger units. In order to replace time-expired plant at this station and to cope with the load, four 60 MW units will be required in the early 60's.

The Report also contains planning programmes for the Regional Electricity Boards, and various coastal areas and town councils.

Apart from the normal steam and hydro-stations, the Commission is mostly interested in the potentialities of the gas turbine—particularly in its coal-burning version—as Queensland has water troubles, and lacks natural oil. The Commission is also following with interest the experimental use of wind-power, as there are several centres in the far north where trade winds blow for a considerable portion of the year and small plants would prove most useful.

"Prefab" Diesel Plants

In spite of many supply difficulties, considerable progress is recorded in the establishment of schemes for small townships in Western Queensland to be controlled by local authorities. These schemes involve the establishment of Diesel stations in prefabricated power-house buildings using a standard size of set and layout.

Single-cylinder horizontal Diesels will be used fitted with protection against over- and under-speed, excess water temperature, excess bearing temperature and oil shortage. The engines are coupled by vee-belt drive to fully compensated, self-excited, rotating armature-type machines, thus obviating the need for external voltage regulators. When operated in parallel, they adjust themselves automatically for power-factor and load sharing.

The number of sets in each station varies from two to four depending on the number of consumers to be supplied, and standardisation has permitted a pool of spares to be established.

To reduce the operating costs, sets of 16 kW capacity were decided upon, and to avoid overloading it is proposed at the outset to avoid the installation of electric stoves, wash-boilers and radiators, electric welding plant and electric motors exceeding 3 h.p.

Even with these restrictions, however, there is ample scope for the domestic use of a large range of appliances and equipment for lighting, heating and refrigeration, together with reasonable hospital requirements and water-supply and sewage loading.

The Commission has taken all necessary steps to establish these small undertakings on a sound basis and provided the calibre of the Superintendents is satisfactory and proper enthusiasm and control is exercised by the Local Authorities the prospect of their future success is bright.

Considerable progress has been made in the implementation of proposals for uniformity of approval of electrical equipment. The principle advantages of these proposals is that the procedure to obtain approval of an article previously approved in another Australian State will be simplified and accelerated. At the same time the existing standard of safety will be maintained.

NORTH WALES H.E. BILL

THE text has now been published of the North Wales Hydro-Electric Power Bill which the B.E.A. proposes to introduce in the next session of Parliament. It relates to three of the eight schemes put forward by the Authority about three years ago. These concern Dolgarrog, Maentwrog and Ffestiniog. In connection with the first-named two, extensions of the existing catchment areas, involving the construction of leats and tunnels, are proposed, which should result in the production of a further 27 million units per annum. In the Ffestiniog scheme, it is proposed to utilise the water run-off from some of the hill ranges in the Blaenau Ffestiniog area and 3 new power stations with a total generating capacity of 27,000 kW, would be constructed, to give an average yearly output of about 45 million units. The Bill contains a proviso stipulating the minimum rate of water flow in the various streams and aqueducts; and procedure for the acquisition of certain properties. The various local authorities concerned have already been consulted by the B.E.A., and no great opposition to the proposals are now anticipated. The Merioneth County Council has, however, decided to oppose the Bill, as a committee recommends that the B.E.A. should (*a*) supply to all local authorities affected by the schemes with such water as they might require; and (*b*) expedite electricity supplies throughout the county.

Small Motors—

No. 4. CAPACITOR AND SHADED POLE

A review of the characteristics, construction and application of these f.h.p. machines

By J. L. WATTS, A.M.I.E.E.

THERE are three types of single-phase motors in which condensers or capacitors are used. The plain capacitor motor, which is also known as the single-value capacitor motor, the permanent capacitor motor, and the capacitor-run motor, will first be dealt with. Its construction is generally similar to that of the split-phase motor in that it has a main and an auxiliary winding on the stator; a capacitor is connected in series with the auxiliary winding, but no centrifugal switch or other switch is connected in series with the auxiliary winding.

The capacitor enables the phase difference between the currents in the main and the auxiliary windings to be made greater than in the split-phase motor, with the auxiliary winding current leading the main winding current; in consequence the ratio starting torque/starting current is generally increased for a given type of rotor. This motor is most commonly built in sizes between 1/100 and 1/20 h.p. A 1/50 h.p. capacitor motor may have a starting torque of about 150% of full load torque, whilst a motor of ¼ h.p. may have a starting torque as low as 40% of full load torque with a starting current of about 400% of full load current.

Running Performance

In motors over about 1/20 h.p. a compromise has to be made between good starting performance and good running performance, because a value of capacitor which gives a good starting torque may result in overheating when running. Since the capacitor has to carry current all the time the motor is running it must be of the paper-insulated continuously rated type. The voltage across the capacitor, and also across the auxiliary winding, rises as the motor speeds up from rest, and each may be subject to more than the supply voltage. It is a peculiarity of this motor that it may run hotter on light load than when full loaded; this effect may be reduced by using a smaller capacitor, although this will reduce the starting torque and increase the voltage across the capacitor. The motor has a fairly high power factor and efficiency, but normally the starting torque is not very high. See Fig. 1.

Fig. 2 shows the connections used in two types of capacitor motor. In Fig. 2a the main windings are connected to the supply, whilst

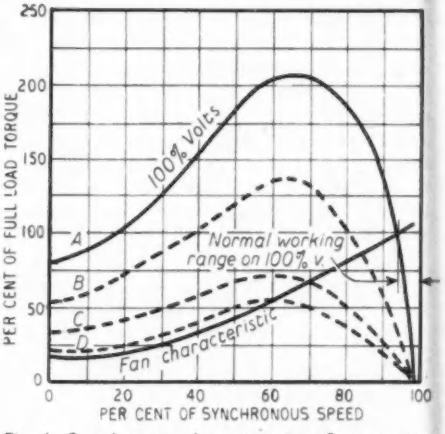


Fig. 1. Speed-torque characteristics of a capacitor-run fan motor on various voltages

the auxiliary windings are connected across the supply through a condenser. In Fig. 2b the main windings are connected to the supply through the condenser, the auxiliary winding being connected in parallel with the condenser. A special type of capacitor motor is sometimes used for driving slow speed ceiling fans which may have about 12 pairs of poles. The stator of this motor, carrying the primary winding, is attached to the motor shaft, which is fixed. Surrounding the stator is the annular core of the secondary winding fastened to the case to which the fan blades are screwed.

The capacitor motor can be reversed by changing over the connections to either the main or the auxiliary winding. This type of motor can be designed for "plugging," i.e. switching into reverse whilst running at full speed. Fig. 3 shows the connections of a

reversible high-torque capacitor motor which is suitable for small power machine tool drives. The main and auxiliary windings of this motor are alike; it is reversed by switching the capacitor in series with one or other of the windings.

Capacitor motors have a small variation of speed from no load to full load and are generally suitable for small constant speed drives, such as fans, blowers, oil-burning equipment and the like, where quiet operation is essential. As indicated by the curves B, C and D in Fig. 1, the speed of the motor on fan and similar duty can be reduced somewhat by reducing the voltage applied to the motor by means of a series resistance. This method is unsuitable for constant torque drives, however, because reduction of voltage reduces the peak motor torque and also increases the current/torque ratio.

Capacitor motors may also be specially wound for two-speed duty on drives such as fans and blowers. The connections of two such types of motors are shown in Figs. 4 and 5. Change of speed is effected by switching operation which has the effect of changing the value of the magnetic flux acting on the rotor, in much the same way as a change of applied voltage.

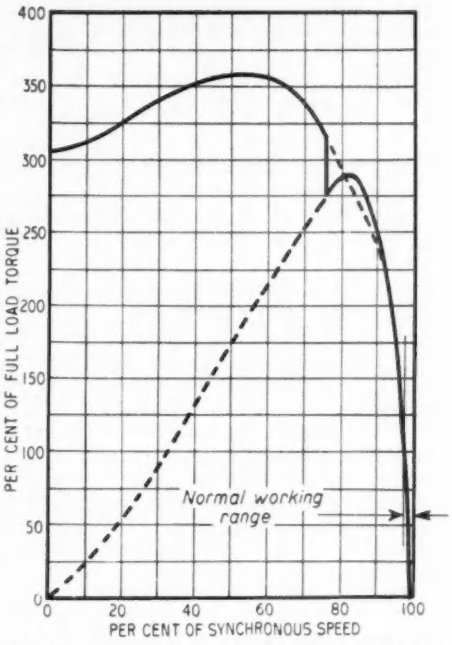
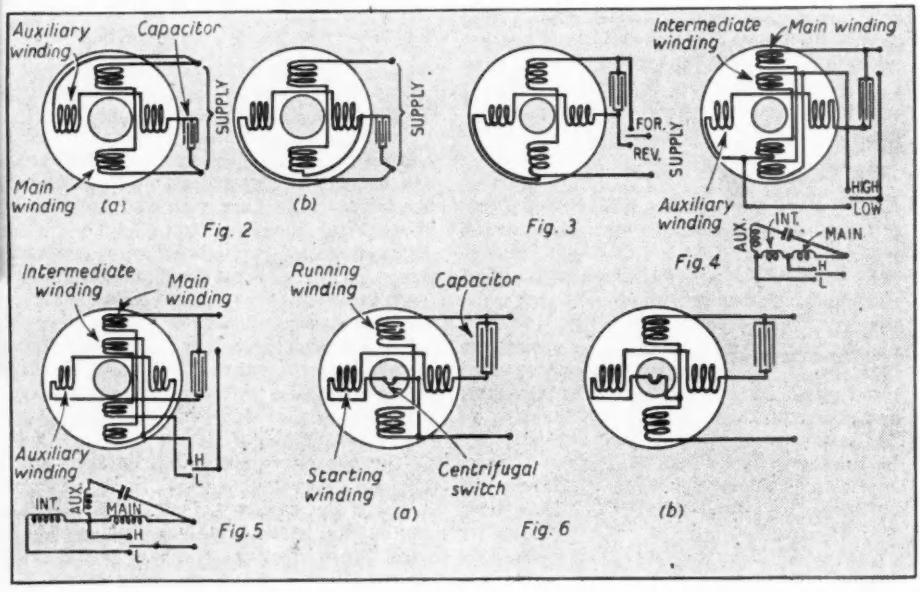


Fig. 7. Speed-torque curve of a typical capacitor-start motor

Figs. 2 to 6 show connections for capacitor-run motors (2), a high-torque intermittently rated capacitor motor (3), a two-speed capacitor-run motor with L connection (4), and T connection (5), and for capacitor-start induction-run motor (6)



Capacitor motors are also obtainable for dual voltage. In one such motor the auxiliary winding, main winding and capacitor are in two sections, which are connected in parallel for low voltage and in series for high voltage.

Capacitor-start Motors

Capacitor-start motors have the same general construction as capacitor motors, but the auxiliary winding and capacitor are arranged to be switched out when the motor has started. The auxiliary winding, which is now termed the starting winding, is usually short-time rated and switched out automatically by means of a centrifugal switch when the motor has accelerated to about 75% of synchronous speed at starting. The capacitor is frequently an electrolytic one, such condensers having a small bulk for their capacity. A typical electrolytic condenser is rated to carry current for up to three seconds duration, with about three minutes rest between operations. These capacitors may deteriorate if not used for long periods. Fig. 6 shows two examples of connections used in capacitor-start induction-run motors.

One advantage of the capacitor-start motor is that, since the capacitor is only in circuit during starting, it can be made of a size which will give the maximum starting torque, although this would not necessarily give the highest running torque. Thus, although some capacitor-start motors may develop only about 100% of full-load torque at starting, with 350% of full load current, it is more common for the capacitor-start motor to develop about 300 to 350% of full load torque with 450 to 600% of full load current at starting. The latter designs of machine may have a run-up torque of 200 to 300% of full load torque. Capacitor-start motors run at a fairly constant speed over the full range of load, as will be seen from Fig. 7, and are in common use driving compressors, refrigerators, pumps, machine tools, and other drives which may require a fairly high starting torque. It may be noted that reduction of size of capacitor reduces the starting torque and increases the voltage across the capacitor during starting.

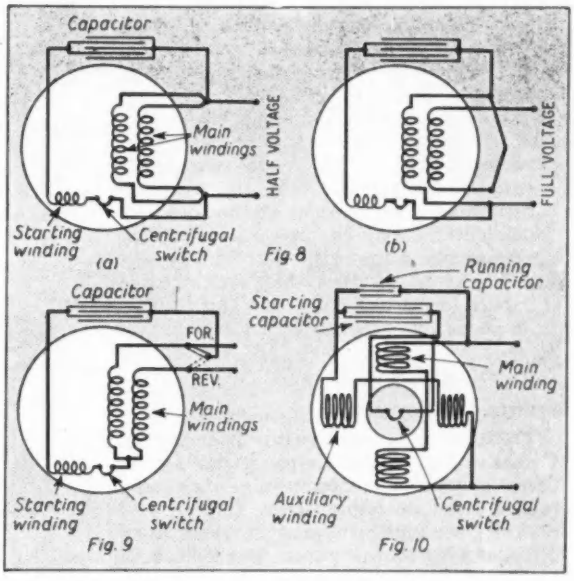


Fig. 8 shows connections for a dual-voltage capacitor-start motor, while in Fig. 9 the swing-connected motor is seen, and in Fig. 10 the capacitor start and run

Capacitor-start motors are available for dual voltage. One type has its main and auxiliary windings and capacitor in two sections arranged for the two sections to be connected in parallel on low voltage and in series on high voltage. Fig. 8 shows the connections of another dual-voltage motor. The main (running) winding is in two sections on the same magnetic axis, whilst the starting winding is a separate winding arranged to create poles midway between the running poles. On the lower voltage the sections of the running winding are connected in parallel with each other, and in parallel with the starting winding through the centrifugal switch as shown in Fig. 8a. On double voltage the sections of the running winding are connected in series with each other across the supply, whilst the starting winding is connected through the centrifugal switch between the mid-point of the running windings and one terminal of the supply as shown in Fig. 8b. Thus the running winding acts as a transformer of 2 to 1 ratio to feed the starting winding at a fixed voltage. Fig. 9 shows the connections of the swing-connected capacitor-start motor, which is particularly suitable for reversing duty.

Capacitor-start-and-run or two-value capacitor motors are less common. These machines

have two condensers or capacitors. One capacitor of large capacity, which is usually short-time rated, is connected in series with the auxiliary winding at starting; the size of starting capacitor is chosen to give the motor a high starting torque. When the motor has accelerated to a certain critical speed at starting this capacitor is switched out, usually by means of a two-way centrifugal switch, and a smaller capacitor connected in series with the auxiliary winding for running. In this way good running conditions may be obtained. Another design of motor has two capacitors which are connected in parallel for starting, and in series for running, or one capacitor only may be left in circuit for running, as indicated in Fig. 10. The running capacitor must be continuously rated.

Running Capacitor

The running capacitor serves the purpose of increasing the pull-out torque, improving the power factor and efficiency on full load, and reducing the operating noise. One type of capacitor-start-and-run motor develops about 100% of full load torque at starting with about 350% of full load current, whilst another design develops about 350% of full load torque at starting, as indicated in Fig. 11. Unlike the capacitor-start motor the capacitor-start-and-run motor will start from rest against light load if the centrifugal switch is not making contact in the starting position. The motor is useful for constant speed drives requiring a high starting torque, high efficiency and high power factor; it may be reversed by reversing the connections to either the main or the auxiliary winding.

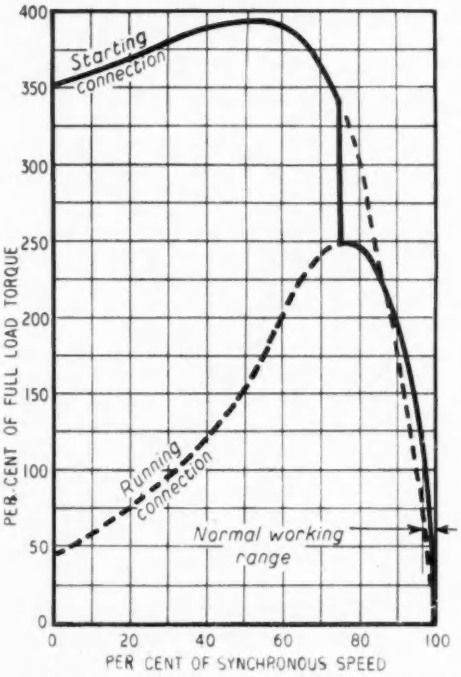
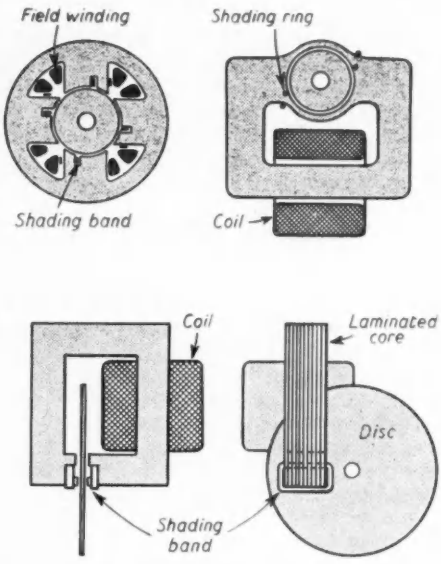


Fig. 11. Speed-torque characteristics for a typical capacitor-start and run motor

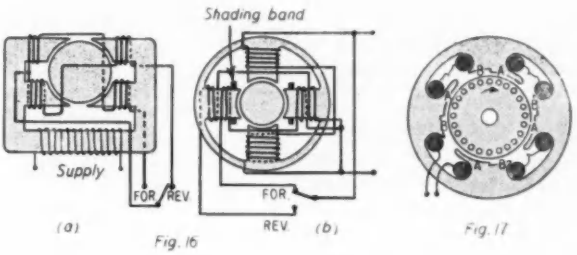


Figs. 12 (top, left), 13 and 14 (bottom) show various forms of shaded pole motor

Shaded-pole Motors

Shaded-pole motors are a cheap but rather inefficient type of single-phase motor, commonly used for driving small fans. They are seldom found in sizes over about 1/50 h.p. Fig. 12 shows a common arrangement of such a motor which has salient (shaped) poles. A portion of each pole face (usually about 30%) is encircled by means of a bare short-circuited copper band. Each pole acts partly as a transformer, of which the insulated mains-fed winding is the primary and the copper band the short-circuited secondary. Current induced in the copper band delays the cycle of magnetic flux in the portion of the pole face which it encircles, so that peak flux occurs in this part of the pole face after it has occurred in the rest of the pole face. Thus a rotating magnetic field is set up which causes the rotor to turn in the

Fig. 16 shows the winding connections for two types of shaded pole motors, while Fig. 17, on the extreme right, illustrates the arrangement of a reluctance-start motor



direction of the encircled portion of the pole faces from the other portion.

Shaded-pole motors are also made with distributed windings fitted in the slotted stator core, as used in the split-phase and capacitor

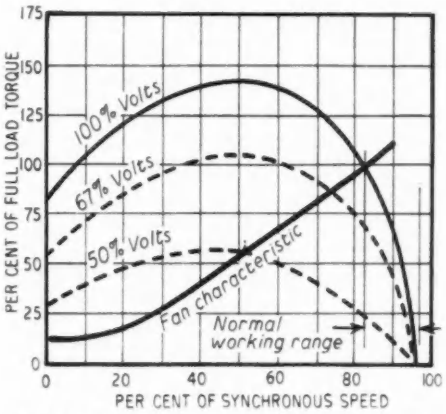


Fig. 15. Speed-torque curve of shaded-pole motor

types of motor. In such motors the shading coils usually consist of a few turns on insulated wire of large cross sectional area. Fig. 13 shows the arrangement of another type of shaded-pole motor.

The characteristics of the shaded-pole motor depend on the design of the machine. Such a motor usually has a peak, or "pull-out," torque of less than twice the full-load torque. See Fig. 15. In some cases the starting torque may be as low as 30 to 50% of full load torque, whilst the full load efficiency may be about 10%. The full-load "slip" is generally greater than in other types of induction motor. Shaded-pole motors which are designed to drive fans, or other devices, which are not subject to overload may have a pull-out torque as low as 125% of full load torque, so that the motor can be given a reasonably high starting torque. Shaded-pole motors may have little variation of current from full load to no load and, in fact, can often be stalled for long periods without damage. This feature makes the shaded-pole motor a useful machine for operating small valves, etc. It may be noted that decreased resistance of shading rings results in better starting, but inferior running conditions.

In small sizes the shaded-pole motor is sometimes made with a rotor which consists of a copper or aluminium disc, as in Fig. 14. The speed of such a motor may be varied by varying the position of the poles of the electromagnet with respect to the disc, i.e. by moving the poles towards the centre of the disc the speed may be increased, and vice versa.

Reversing

Since the rotor of the shaded-pole motor runs in the direction of the encircled portion of each pole face, the motor may be reversed by interchanging the two halves of each pole face. In some cases this mechanical operation may be carried out by reversing the stator in its end shields, or by reversing the stator and end shields on the bearings or shaft. Fig. 16 shows the arrangement and connections of two shaded-pole motors which can be reversed by switching operation. Fig. 16a refers to a motor which has two shading windings, arranged for opposite directions of rotation, which can be short-circuited alternately. Fig. 16b refers to a motor having coils on auxiliary shaded poles; by means of the reversing switch an auxiliary pole can be made to act as the shaded pole for either one of the main poles.

In the case of a shaded-pole motor which drives a load requiring reduced torque at reduced speed, such as a fan, an appreciable amount of speed reduction can be obtained by connecting a resistance or reactance in series with the motor to reduce the motor voltage as indicated in Fig. 15. Another type of two-speed shaded-pole motor has four poles, with coils on two poles. By connecting the two coils to create poles of the same polarity the unwound poles acquire the opposite polarity and the motor becomes a four-pole machine. If the

two coils are connected to create poles of opposite polarity the motor becomes a two-pole machine and runs at maximum speed.

Reluctance-start Motor

The reluctance-start single-phase motor operates on the same general principles as the shaded-pole motor. The arrangement is shown in Fig. 17. In this motor the lag of the magnetic flux in a portion of the pole face is obtained by having a stepped air gap under each pole face. Since the part of the pole which has the least air gap will have the least reluctance, most of the flux will pass from the pole to the rotor through the short air gap. There is, however, less hysteresis in the part of the magnetic circuit which includes the wider air gap and consequently the flux across the wider gap reaches its peak value before that across the short gap. Reaction between these magnetic fluxes and the induced current in the rotor conductors causes the rotor to be pulled in the direction from the longer to the shorter air gap.

Testing Industrial Instruments

Discussion held by the I.E.E. Measurements Section

OPENING the discussion on "The Servicing and Maintenance of Electrical Instruments," held at the I.E.E. last week, Mr. W. Bamford, deputising for Mr. A. J. Young, covered the general field of instrumentation.

The electrical instruments used in industry consisted of two groups: those which measured electrical quantities directly, and those which measured a variety of physical constants by means of electrical detecting devices. The first group did not present any very troublesome maintenance problems provided they had been properly installed and used in the conditions for which they had been designed.

The second group, as far as the electrical side was concerned, also presented few maintenance troubles. The auxiliary equipment, however, could often be improved. Where electronic equipment was concerned, maintenance could be difficult. A component that failed could be hard to locate and difficult to replace. Many troubles were due to faulty leads and switches.

The second opener, Dr. Denis Taylor, described the servicing of electronic instruments as carried out in Ministry of Supply factories. Much progress had been made in improving the reliability and life of some of the newer components, but failure rates remained high. At one factory, where about 2,000 electronic instruments were in daily use some 60% of failures were due to thermionic valves and 20% due to resistors.

In atomic energy research, much use was being made of cold cathode valves and the reliability obtained was very high. Transistors of the point and junction types had so far been used only experimentally and it appeared that the use of this type of component would be of considerable value in improving reliability and hence reducing the servicing required.

When the discussion was thrown open, the speakers generally recognised that electrical instruments of the conventional type were comparatively trouble free, and they therefore confined their remarks to electronic gear.

Several speakers gave their experience on the failure rates to be expected for various components, particularly valves, resistors and capacitors, one speaker adding small power transformers to the list of components particularly prone to failure. Varying assessments were given on the relative importance of each category, and among valves, power rectifiers were cited as one of the highest failures.

It was not considered practicable to estimate probable lives for valves, and the importance of gradual changes in characteristics depended upon the design of the instrument.

The value of plug-in units was generally recognised. Some speakers favoured the use of fully-sealed expendable units where appropriate. Accessibility was important in saving valuable process time and time of maintenance staff. Standardisation of dimensions would also assist speed and convenience. Many speakers criticised the modern tendency to over-miniaturisation, which in most industrial applications was unnecessary.

Some speakers favoured the design of equipment for null indication or the use of compensating circuits, so that variation in characteristics of components or in mains voltage had negligible effect. On the other hand, in so far as such practices increased the number of components they did not necessarily improve over-all reliability. The possible applications of magnetic amplifiers and transistors were touched upon. It was pointed out that magnetic amplifiers could not entirely replace valves and used more power. A magnetic transductor could sometimes usefully replace a high-current shunt for a meter.

BETTER AIR ELECTRICALLY

Use of Ultra-violet Lamps for Deodorisation

MANY industries exist in which undesirable smells are an unavoidable accompaniment of production; and where large numbers of people are congregated, a similar problem is liable to arise. In a paper presented recently to the Institution of Heating and Ventilating Engineers, DR. W. SUMMER, D.SC.(TECH.), F.INST.E., A.INST.P., Barber Medico-Electronic Laboratories, Ltd., discussed the ways in which electrical methods can be used to keep the atmosphere sweet in spite of such disadvantages.

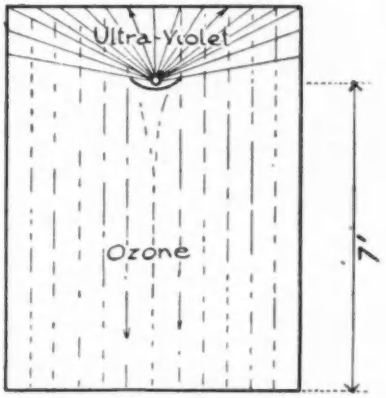
Chemistry of Process

Smells are associated with certain typical chemical radicals, and the most effective method available for combating them is to break them down into different, inoffensive compounds. Oxidation is an available technique, ozone being a convenient vehicle for the reaction, since it is highly effective, always available when there is a supply of air, and usually non-corrosive. Moreover, it can be conveniently produced in a highly reactive nascent state.

Chemical methods of producing ozone are impracticable for air conditioning purposes, but two physical methods are available. One method uses the silent electrical discharge between plates of a leaking condenser. Three main disadvantages exist in this process. Firstly, nitrous oxides are formed as well as ozone, and these are undesirable for physiological reasons; secondly, the volume of air treated is very small on a time basis; and finally, those molecules of odoriferous material which have been absorbed by porous surfaces will remain untouched.

Ultra-violet radiation is the other available agent, the energy content of wavelengths below 2,400 A (24×10^{-6} cm) being sufficient to bring about the oxygen-ozone transformation. Mercury vapour lamps with fused quartz envelopes are the practical source of such radiation, the lower limit of transparency of the quartz being 1,849 A. At low pressure (a few microns) some 95% of the radiation is at 2,537 A, and most of the rest lies between this figure and the lower transparency limit, and is responsible for the production of ozone. Radiation of wavelength 2,500 to 2,650 A is bactericidal.

Ozone itself is not very stable, and breaks down into oxygen when heated to 518° F. This is an important consideration when there is a heater unit as well as a u.v. deodoriser in the ducts of a ventilation plant. A typical deodoriser for use in a room might have a mercury vapour tube above an aluminium reflector, the radiation being directed towards the ceiling. If the apparatus is at least 7 ft. from the floor, radiation will not injure the conjunctiva of people in the room. Since the density of ozone is 1·658 against 1 for air, any formed will sink to the floor of the room without the need for artificial means of air excitation.



Placing of typical room unit

Generation

The type of ozone generator usually used has an ignition voltage of 700 to 1,000 V. The tube itself is commonly flat U-shaped, with the metal electrodes in the arms, the control gear being placed between the electrodes. A high reactance transformer is used, the voltage dropping to 300 to 450 V when the tube is running. Reflectors have to be made from the purest aluminium to withstand the u.v. radiation. The consumption of a complete unit is about 50 W.

In industrial applications in which the output has to be concentrated almost entirely on the source of the obnoxious odour, it may be necessary to mount the generator with its radiation directed downwards. In this case eye-protection may be obtained by mounting the generator below normal eye-level.

When forced ventilation and air conditioning systems are in use, the ultra-violet deodorisers should be the last member in the series of processes to which the air is subjected. Some slowing down of the air stream in the ventilation system may be necessary to allow the necessary "contact time" (30 to 60 seconds) with the radiation. The deodorising unit may then consist of a battery of quartz tubes fitted at the entrance of an expansion chamber. The table shows the installation of duct units that may be necessary to overcome various degrees of contamination.

Many examples of effective installations are given in the paper, ranging from an animal waste-products disposal plant at which the whole surrounding district was being troubled by objectionable smells, to a potato crisp factory, where the problem was to prevent workpeople's clothing from absorbing the smell of frying oil.

Type of contamination	*c.f.m. of air deodorised per generator*	*Electrical consumption W per 1,000 c.f.m. of air*
A	250	200
B	170	300
C	100	500
D	70	700

A = offices, cinemas, churches. B = dance halls, theatres, exhibitions, small hospital wards, normal metabolic odours (exhaled air, sweat); contamination not exceeding 10 p.p.m. C = large hospital wards, light industrial smells; contaminated steam or air of high relative humidity. D = very offensive heavy contamination greater than 10 p.p.m. with chemical or metabolic (decomposition) odours (mercaptans, sulphides; gut cleaning stations, cattle products, fertilisers, morgues); suspension of offensively smelling solid particles in air.

Average life of generators is put at 2,000 to 2,500 hours, there being some falling off in efficiency during useful life. Maintenance is restricted to much the same attention as would be given to ordinary lamps intended for illumination purposes.

MARKETING—YET AVOIDING WASTE

AN exchange of ideas in marketing and salesmanship of various types of goods which have become household names, was given at the conference held by the Incorporated Sales Managers' Association last Friday, under the theme of "Avoiding Waste in Distribution." The conference was divided into three sessions, at the first of which, Mr. F. H. Bunn, director and general sales manager of Hoover Ltd., spoke on "Assessing the Market and Selecting the Target." He stressed that on the accuracy of the sales forecasts by the sales manager depended the schedule of the production team, the avoidance of waste in over-estimating and of the ill-effects on sales force and retailers of under-estimating.

Value of Surveys

Market surveys were of immense value but they were not an exact science. Before their new washing machine factory was built some three years ago, an exhaustive market research was carried out, but today they were selling more than four times as many machines as they then forecast. Their one mistake, he explained, was that the survey did not fully take into account the power of salesmanship and skilful marketing.

They found that almost overnight they had been able to make the housewife washing-machine conscious. In Australia today, too, they were selling as many washing machines as was originally forecast for Great Britain!

It was also essential to know about competitors' prices, the quality of the products, the methods of selling organisation—and the degree of saturation in the market. It was here that consumer research could help; the closest liaison between production and sales must also be maintained.

At the second session, Mr. S. Roberts, director Hoover (Washing Machines) Ltd., and home sales manager of Hoover Ltd., taking as his subject "Training and Briefing the Sales Force," explained his firm's method of selecting salesmen before putting them through a seven weeks' course, of which two were spent in the field. In addition, each fortnight all sales-service representatives attended a half-day training session conducted by supervisors, for they believed that the value of training was lost unless it was continuous and interesting. There were also supervisors' training courses dealing with management and leadership, and more advanced courses for district managers. In addition to good remuneration plus incentives in the way of commission and bonuses, he spoke of the competitive spirit developed by pitting branch against branch and district against district.

The importance of securing the co-operation of distributors was covered in the third and final session by Mr. C. H. Crowlie, director, Hoover (Washing Machines) Ltd., and export sales manager of Hoover Ltd. His company offered the dealer one or more of their trained representatives to sell on his behalf, and to lend a hand with displays, while their Exhibition Department gave dealers local support, he explained. On the export side of the business the same methods were followed, but the scope of the firms' co-operation was often even wider, especially in regard to technical information, in that in some cases the products were assembled abroad. Mr. Crowlie also referred to films as a sales aid, and the film "Time Off My Hands" was shown as an example.

At the luncheon on Friday, Lord Luke was invested with the badge of office as the Association's new president.

STATIONS WITHOUT WALLS

American Experience with Outdoor Operation

POWER stations without walls and roofs seem to offer big savings in initial costs, but the practicability of such designs in Britain's climate has occasioned much doubt. Nevertheless, the B.E.A. has announced its intention of building a 180 MW station at Ince, near Ellesmere Port, with a semi-outdoor boiler house so information on the problems that arise in operation are of direct interest. A helpful paper on this subject was recently published in our American contemporary, *Electrical World*, based on the experience of the Texas Electric Service.

At present the company operates ten outdoor turbine installations in four stations, the set sizes ranging from 13 MW at 600 lb/sq. in., 825° F. to 80 MW, 850 lb/sq. in., 900° F. All the units are provided with automatic combustion control. Though no direct information is given on the rainfall and humidity conditions that have to be faced, the temperature range is given as 2° F. to 100° F. and on occasion temperatures have stayed well below freezing point for a week at a time.

Noise a Nuisance

One of the first troubles met with due to the absence of walls was excessive noise, which disturbed the occupiers of nearby houses. The most objectionable interference came from cooling tower forced-draught fans, exhaust stacks on boiler blow-down tanks and vents on deaerating heaters. In some cases enclosing fan suction openings produced a worth-while reduction in noise, an incidental advantage here being reduction in icing over. Later plants have used slower fan-speeds, which has obviated the necessity for enclosure. For vent lines, a solution found was the fitting of exhaust hoods in some cases, and silencers in others. Pipe line noises in general were very materially reduced by wrapping the line with several layers of hair felt, which was further covered to protect it from rain.

Air for instrument operation had to be drawn into the compressors through high efficiency driers, otherwise air lines and operating mechanism would freeze during cold weather. The driers now being fitted give air with a dew point of –40° F. Freeze protection is necessary for all lines carrying liquid or steam, even for those which are hot while in operation. Steam tracer lines were originally employed, but these themselves froze during the first period of very cold weather, due to improper drainage. Because of this experience, the steam tracers have been replaced by soil heating cable, this being installed in 60 ft. lengths rated at 400 W at 110V.

Where pipes that may become hot are involved the heating cables are provided with a layer of insulation between them and the pipes. In some cases, several small pipes are run in a metal trough with one heating cable. All heating cables terminate in a switchbox, with snap switches for each group. The whole system is controlled by one or more thermostats which automaticaliy turn on the system when the temperature drops to 34° F.

Maintenance

It is necessary with outdoor plant to ensure that annual inspections are scheduled to avoid extreme cold weather. If working on plant is necessary in bad weather prefabricated shelters are erected over the equipment concerned. A particularly difficult problem arises from the hazard presented by gangways, staircases and operating floors during periods of freezing rain and sleet. Some form of embedded heating cable would probably provide an answer, but the cost is difficult to justify.

Operating motors were originally installed in the standard splash-proof design, but further protection from rain has been found to be required. Several coil failures on motors were suspected of originating in rain splashing up from pedestals during downpours, and being swept into the windings. Extension of air intake ducts to below the pedestal provides some relief. On vertical motors a metal hood was provided with vertical sides extending well below the air intake ports. Care must be taken to leave sufficient area between skirt and motor so as not to restrict the free flow of air. Some motors may need heaters to keep them dry during idle periods.

Switchgear must be dust proof and rain proof; pressurised cubicles are being considered as a possible answer. The position here is complicated in Texas by the occurrence of dust storms and sand storms, which would not of course be expected to give trouble in this country.

overseas news

Tully Falls Contract

Acceptance of a £1,560,700 tender from a local concern for important contracts in the Tully Falls hydro-electric scheme, Queensland, was announced by the co-ordinator general of works, Sir John Kemp, recently. In this contract, the work includes a "pond" on the Tully River half a mile above the falls, intake routes, tunnels and tanks. Sulzer Bros. are to provide the Queensland contractors with technical help, and it is hoped that the scheme will be in operation early in 1955. The project provides for the installation of two 18,000 kW English Electric generators. The scheme is planned to link with the proposed Burdekin Falls hydro-electric project.

Restriction

Latest of the States to be perturbed by lack of financial funds is Tasmania. There, Mr. Gair, the acting Premier, has intimated that the Loan Council had approved a total expenditure of £4,525,000 by the Regional Electricity Boards on development work for the current financial year. New loan raisings authorised and required to meet the programme amounted to £3,955,000. But despite continuous effort by the State Electricity Commissioner, Mr. N. Smith, throughout Australia, it had not been possible to obtain the money through the normal channels. The position was now that unless some immediate relief was found, the State Hydro Electric Commission and the boards would be faced with the prospect of closing down completely their programme of electrical development.

Sydney Take Over

Formal notice has now been given by Mr. J. J. Cahill, Minister for Local Government, that the Electricity Commission of New South Wales will take over the electricity generating assets of the Sydney County Council on January 1, 1952 (as was anticipated). Although the hand-over will take place on that date, the actual transfer is expected to take many months to complete—three committees have been considering the problem for some time. The Sydney County Council will, henceforth, be concerned only with electricity distribution, a bulk supply being taken from the Commission.

British Plant for New Brunswick

The first of two new 6,250 kW steam generators was put into operation last month at the Grand Lake power plant of the New Brunswick Electric Power Commission. Steam for the two generators is supplied by a 150 klb unit using pulverised coal from the nearby Minto coalfields. The second 6,250 kW generator is expected to be ready for use by the end of the year, and a third new set, of 15,000 kW capacity, will be shipped from England early next year for installation at the station.

Another $5 M for Rural Electrification

Before many years, perhaps in five, all farmers in the province of Quebec will have electricity at their disposal, declared Premier Duplessis in the Assembly last month, when an appropriation for an additional $5,000,000 for rural electrification was being voted, which will do much towards solving rural problems. Electrification in the province is operated through a system of rural co-operatives formed under legislation introduced in 1945, but statistics show that electricity companies are also very active in this direction and in the main supply the rural co-operatives with power for the local distribution system. In 1945 some 20% of the farmers had an electricity supply, since when an additional 32% have been connected. A sum of $15 million for the scheme was originally voted by the Government in 1945.

Pine Falls

Turbines at the Pine Falls hydro-electric project, Manitoba, were given their first mechanical tests on site a few days ago, the Provincial Hydro Electric Board has reported. It is expected that the first unit will go on load this month.

Credit Restrictions

A further appeal for the easing of credit controls has been made by the Victoria (British Columbia) Electrical Retailers' Association. They want the down payment decreased from one-third to one-quarter, and the repayment period extended from 12 to 18 months. In the month of October last, business was about $165,000 down on the October 1950 figure, they report.

More State Boards

The urgent necessity for all states in the Indian Union to lose no further time in setting up quasi-autonomous State Electricity Boards, was stressed by Mr. K. G. Milne in his presidential address to the Federation of Electricity Undertakings of India recently. So far, only Madhya Pradesh and Delhi had set up such boards, and he urged the establishment of others, under the 1948 Act, to overcome the red tape associated with purely governmental policies. Turning to another important point, the Budget proposal for a tax on electricity, he said that on the results of the industry's long struggle against the States Electricity Duty, the principle that electrical energy was an essential commodity not to be taxed, except with the consent of the Presi-

dent, had been accepted by the Central Government in the Essential Goods (Declaration and Regulation of Tax on Sale or Purchase) Bill. This draft Bill covers electricity for industrial consumption and the Bill when enacted will make State Government imposts on such consumption subject to the sanction of the Centre, thus enabling the industry to approach the Central Government. The Federation's initial attempt to widen the scope of the Bill to include domestic lights and fans consumption also, has not met with success, but they are to continue their efforts when the Bill comes before Parliament.

New Towers

As part of the Corporation's power development scheme, the third of the new cooling towers at the Salisbury power station, Southern Rhodesia, is now nearing completion. The latest tower, the shell of which has been finished, is the fourth built for the Municipal Electricity Dept. Two of these will be put into use almost immediately, but the third, which has been constructed ahead of plan, will probably not be used until the second part of the new power station extension is completed—in 1953 or 1954.

Another Visit to Lardarello

At the instigation of the New Zealand Government, Mr. W. M. Fisher, inspecting engineer of the Ministry of Works, and Mr. R. McMillan, drilling superintendent of the Mines Department, will leave shortly for Lardarello, in Italy, to consult Italian experts on the development of Wairakei's geothermal steam resources for power generation. They will be back in New Zealand before the end of December to launch the second and perhaps most critical phase of the Wairakei exploration early next year. Mr. Fisher is in charge of the investigation of all New Zealand power projects, and he has been largely responsible for the conduct of the geothermal work at Wairakei. His main inquiries in Italy will be concerned with a technical comparison of the geological characteristics at Wairakei and at Lardarello.

Heated Debate

Political recriminations were the order of the day in the New Zealand House of Representatives recently, during a discussion on the Electric Supply Account vote of £13,250,000 for 1951-52. Government members blamed the former Labour Government for the present electric power shortage, and the Opposition retaliated with the claim that all the present schemes for which the government took credit had been started when the Labour government was in office. In the course of the debate Mr. W. S. Goosman's administration of the Works Department and the State Hydro Electric Department came in for determined criticisms. To these attacks, Mr. Goosman supplied answers, although adding little to the information already known. But he reaffirmed that until the government had ascertained how effective is generation of electricity from natural steam sources in the Wairakei area, it did not intend to proceed with its ideas of coal-generated steam standby plant for electric power. Another government member, Mr. S. W. Smith, asserted that if the geothermal projects produced the results hoped for, they and the hydro-electric works now in hand would meet the needs of the North Island for many years to come.

Shortage of Cookers

A shortage of electric cookers is delaying occupation of hundreds of houses in Auckland, according to local reports. The shortage has been described as the most acute in the trade's history. It is estimated that 4,000 electric cookers could be absorbed in Auckland immediately but few wholesalers have many in stock. Mr. J. E. Beachen, secretary of the Auckland Electrical wholesalers' Association, has stated that their member firms had asked the Board of Trade to lift the restrictions on the import of cookers, for plenty were available in the United Kingdom. That was no criticism of N.Z. manufacturers, for the local firms could not meet the demand largely because of shortages of raw materials and labour. One wholesaler had orders for about 400 cookers, yet received only seven appliances this year, it is said. One United Kingdom firm had indicated that it could supply 500 stoves a month. These would retail at about £69 each—against the price range of £35 to £65 for the New Zealand product. Since most of the New Zealand manufacturers have their plants in the South Island, some Auckland wholesalers offered to pay air freight to overcome the shortage of shipping. But they were told there were no cookers for sale.

Restrict Sales of Fittings?

The unrestricted sale of electrical fittings which the law required to be installed by registered persons is causing the New Zealand Electrical Federation considerable concern, according to the president, Mr. C. L. Dentice. Many of these fittings are readily obtainable from general stores and similar shops, he points out, and it is therefore, not surprising that purchasers are not aware of the risks involved when carrying out their own repairs under in-expert advice.

The Loan for Mexico

The World Bank is expected to allocate 30 million dollars to Mexico before the end of the year, according to trade sources in Mexico City. The credits would be used to extend the network of power stations in central Mexico and to finance the setting up of a new generator at Vera Cruz.

More Nationalisation?

A scheme for coping with the present inadequate electric power supply in Costa Rica has been put forward by the Minister of Finance. He proposes the formation of a corporation, in which the government will hold 51% and the public 49% of the shares, to take over all existing electricity undertakings. The scheme provides for the construction of two new power stations, one diesel-powered and the other hydro-electric.

PERSONALITIES

IN THE INDUSTRY

At present technical engineer of the North Western Electricity Board's No. 3 sub-area, **Mr. H. Shackleton**, M.SC., M.I.E.E., has been appointed technical and research engineer in the chief engineer's department, in succession to the late Mr. J. L. Carr. Mr. Shackleton, who is 47, received his education at Burnley Grammar School, and Manchester University. He started with the Manchester Corporation Electricity Dept. in 1924 and served as testing assistant in the testing and standardising section. In 1930 he was transferred to Head Office as personal assistant to the late Mr. J. L. Carr (then chief electro-technical engineer). Mr. Shackleton later became electro-technical engineer and personal assistant to the distribution engineer prior to going to Rochdale in 1947 as deputy borough electrical engineer and manager. He joined the Board's No. 3 sub-area in 1948. Mr. Shackleton was joint author of an I.E.E. paper on Network Fault Resistance, and in 1937 was awarded the degree of M.SC. for his thesis on that subject.

Mr. H. Shackleton

The **Marquess of Reading** has resigned his directorship of the Palestine Electric Corporation, Ltd., on his appointment as Under-Secretary of State for Foreign Affairs.

Philips Electrical Ltd., announce that **Mr. J. T. Moore**, operating from an office at the Birmingham branch, and **Mr. I. O. Morton**, who operates from head office, London, have been appointed as assistants to the radio and television sales manager, **Mr. H. M. Thorne**. Mr. Moore is responsible for the territory north of an East/West line following the southern boundaries of the counties of Lincs., Northants., Warwicks, Worcs., Shrops., and Montgomery (excluding Scotland). Mr. Morton is responsible for the territory south of this line.

At the invitation of U.N.E.S.C.O., **Dame Caroline Haslett**, D.B.E., J.P., attended as an expert on technical education for women the U.N.E.S.C.O. Working Party held in Paris earlier this week on "Access of Women to Educational Opportunities." She also attended in her capacity as President of the International Federation of Business and Professional Women.

Mr. A. L. Burnell, F.I.M.T.A., A.A.C.C.A., secretary of the South-Eastern Electricity Board, was last Friday inducted as president of the Brighton, Hove, Worthing and district branch of N.A.L.G.O.

The B.E.A. announces that **Mr. A. R. Cooper**, M.I.E.E., M.INST.F., who has been controller of the Merseyside and North Wales Division since vesting day, has been appointed controller of the North Western Division, in succession to the late Mr. C. T. S. Arnett. Prior to vesting day, Mr. Cooper was chief operation engineer of the Central Electricity Board which he joined in 1935 as chief control engineer of the North West England and North Wales area. In 1937 he was appointed assistant to the chief operation engineer of the Board, and in 1942, operation engineer of the S.E. and East England area. He became chief operation engineer in 1944. His earlier experience included development of power schemes for colliery and coke oven plants.

Mr. A. R. Cooper

Mr. T. G. Baird, A.M.I.E.E., sailed last Thursday for Johannesburg to take up the position of assistant to the system construction engineer of the Electricity Supply Commission of South Africa. Mr. Baird gained early training with the British Thomson-Houston Co., and subsequently became section engineer in the Bedford section of the Central Electricity Board. On formation of the B.E.A. he joined the Eastern Division as assistant transmission engineer, but in February, 1950, he was appointed senior assistant of transmission maintenance co-ordination in the chief engineer's department at the B.E.A. Headquarters in London.

Mr. L. Jones, who has been with the Albion Electric Stores, Leeds, for 30 years, has resigned owing to ill-health. The policy of the firm will continue under the direction of **Mr. J. H. Robertson**, who has been joint general manager for some time past.

In view of the retirement of **Mr. Fitzroy Woods**, M.B.E., M.I.E.E., from the position of district manager at Woking, at the end of next year, the South Eastern Electricity Board has decided to amalgamate the Woking and Guildford districts as from that date. Manager of the new district is to be **Mr. W. E. Affleck**, M.I.E.E., M.INST.F., now district manager at Guildford, to the Board. Mr. Affleck went to Guildford over thirty years ago as assistant manager to the Guildford Electric Supply Co., and when the Corporation took over the undertaking in 1921 he became the chief engineer and manager, at the comparatively early age of 28. That post he held till vesting day.

Retiring after 23 years as station superintendent at Thornhill power station, Yorkshire Division of the B.E.A., **Mr. H. C. Shepherd,** A.M.I.E.E., was the chief guest at a gathering recently when Mr. G. A. Vowles, Divisional Controller, was among those who attended a presentation on behalf of his colleagues. Mr. Shepherd joined the staff as a shift charge engineer in 1919 and after a number of years in charge at Barugh power station returned to Thornhill as station superintendent in 1928. During his period at Thornhill the plant capacity has increased from 14,000 kW to nearly 120,000 kW, and amongst many difficult tasks with which he has had to contend was the particularly serious flood which occurred in September, 1946. He is succeeded at Thornhill, by **Mr. F. Bates,** ASSOC. I.E.E., A.M.INST.F., as we have already recorded.

Dr. D. J. E. Ingram, of New College, Oxford, has been appointed Research Fellow in the Department of Electronics, University College, Southampton, with effect from January 1. He will be mainly concerned with work in microwave spectroscopy. He has been granted leave of absence until April to complete his work at the Clarendon Laboratory.

Dr. J. A. Sugden has been appointed research and development engineer of the V.G. Manufacturing Co. Ltd. He was formerly with the United Insulator Co. Ltd.

Changes in the management of the Harland Engineering Co. Ltd. are to take effect as from January 1, we learn. **Mr. C. A. Atchley,** who has been connected with the development of the business since its formation in 1903, is retiring from the managing directorship, having reached the age of 70 during the current year. He will retain his seat on the board. **Mr. R. W. Weekes,** sales director, will fill the vacancy created by Mr. Atchley's retirement, while **Mr. K. W. Atchley,** A.M.I.E.E., will continue to hold the position of works director coupled with that of chief of engineering. The company also announce that to still further enhance specialisation services for which the Harland Sectional Electric Drive Department is noted, a wholly-owned subsidiary company is being formed, under the name of Harland Drives Ltd., with the following as initial members of the board: Mr. K. W. Atchley, chairman; Mr. F. H. Maddox (presently manager of the Drive Department), managing director; Mr. R. C. Mortimer (presently chief engineer of the Drive Department), technical director; and Mr. C. A. Atchley.

Merz and McLellan announce they are taking into partnership with effect from January 1, 1952, **Mr. A. E. Powell, Mr. E. L. E. Wheatcroft,** M.A., M.I.E.E., **Mr. H. J. Beard,** B.A., M.I.E.E., and **Mr. W. H. Dixon,** who have been members of their staff for a number of years. Mr. Powell will normally be at their Newcastle office, Mr. Wheatcroft and Mr. H. J. Beard at their Esher office, and Mr. W. H. Dixon at their London office.

We hear from Enfield Cables Ltd. that **Mr. Percy F. Deakin** has been compelled by ill-health to retire from the position of works director.

Mr. Percy F. Deakin

Educated at the East London Technical College (now Queen Mary College), Mr. Deakin joined the Enfield Ediswan Cable Works as a draughtsman in 1919, and became manager of the Copper Wire Mill in 1923, developing the copper rod rolling mill three years later. He was appointed works manager of Enfield Cable Works Ltd., in 1932, and works director in 1943. He retains his seat on the board of the company.

OBITUARY

We deeply regret to learn of the death on December 10, after a brief illness, of **Mr. E. J. Edgar,** M.I.E.E., aged 52, controller of the South West Scotland Division of the B.E.A. Prior to joining the B.E.A. in 1948 he had been district manager for the Central Scotland and South Scotland areas of the C.E.B. since 1943. Earlier he was district manager of the North East England area of the C.E.B., from the beginning of 1938 after serving for six years as operation engineer for the South West England and South Wales area of the grid. He had been chief engineer to the Shanghai Power Co. before joining the C.E.B. in 1932.

Mr. H. E. Ellis, managing director of the City Electrical Co., Ltd., died on December 4, aged 81. He founded that company in 1897; it is now being carried on by his two sons.

Mr. G. P. Dennis, M.I.E.E., chairman of the Liverpool firm of G. P. Dennis Ltd., died on November 28, aged 76. He had been connected with the electrical industry for nearly 50 years, and was head lecturer in electrical engineering at Liverpool Technical College before entering business on his own account thirty years ago. In 1927, he was elected president of the Electrical Wholesalers' Federation, and two years later was president of the Federation's Lancashire and Yorkshire section.

Mr. H. G. Alger, formerly secretary of the old Bournemouth and Poole Electricity Supply Co., Ltd., died on November 28, aged 77. He joined that company as secretary, in 1925, after 17 years as manager of the Richmond (Surrey) Electric Light and Power Co. He retired in 1939.

The death occurred on December 5 of **Mr. G. Griffiths Smith,** aged 61, who, as educational instrument sales specialist for Crompton Parkinson Ltd. since July, 1945, had become well known by principals and teachers in colleges and schools throughout the United Kingdom.

Protection of Systems and Plant

THE London Local Group of the E.P.E.A. held a meeting on Monday last at which Mr. R. K. Edgley (Reyrolles) dealt with the subject of protection. The lecturer started with a brief statement of the principles of protection, namely the division of a power system in a number of zones, each controlled by circuit-breakers, and each provided with its own protection. This protection might be unit-type (not affected by external faults) or non-unit type, in which case it should be graded or discriminative in order not to trip on external faults. Unit-type protection was generally to be preferred. The implications of these requirements were then discussed.

Dealing next with specific problems, generator protection was analysed, in particular the effect on back-up overcurrent protection of fault-current decrement, and also the pros and cons of negative-phase-sequence protection. It was suggested that over-current protection should only be used to prevent fault current being fed to the generators from the busbars, and that negative-phase-sequence protection should be allowed to trip, provided that adequate data for its setting was available. A possible alternative would be some form of thermal protection. Attention was drawn to difficulties arising in busbar protection because of the division of current between some of the current-transformers allowing them to work at low flux densities, whilst those carrying the total current had to work at high flux densities. Means taken to alleviate this were described.

Transformer Protection

Transformer magnetising-surges were next considered, and it was pointed out that their severity depended on their position in a power system. The principles of high-speed transformer protection which were unaffected by magnetising surges were described. Some discussion followed on the effect of mutual inductance between double-circuit overhead lines on the accuracy of distance-protection settings. Mention was also made of problems concerning the impedance of pilot wires, induced voltages in overhead pilots, and current-transformer connections.

NEW LITERATURE

Industrial Administration and Management

by F. L. Meyenberg, M.I.Mech.E.

SECTION C of the Institution of Mechanical Engineer's associate membership examination is the aim of this textbook, but by his thoughtful discussion of the questions posed by the syllabus for that test, the author has produced a volume which should interest a wider field than the students he had in mind. Unlike many writers on the subject he covers the whole field of business organisation, not only the factory processes; but throughout he writes from the production engineer's viewpoint. The book is planned in five parts, entitled successively: sales promotion, design, production planning and controls, execution of work orders, and economic control, and within these divisions the usual leading topics are discussed with a freshness of approach that well repays the reading. Published by Pitman, 387 pages, 8½ in. by 5½ in. Price 35s.

Fundamentals of Automatic Control

by G. H. Farrington, B.Sc., A.C.G.I.

SERVO systems in one form or another occur widely throughout industry, and their application grows as mechanisation proceeds. With this an accomplished fact, some knowledge of the principles on which their design and operations are based becomes a valuable asset to any engineer. It is with principles that Mr. Farrington's volume is concerned, and its acceptability to the user of control gear, as distinct from the designer, is enhanced by the mathematics displayed on its pages being somewhat less frightening than those often met with in books on this subject. Moreover, the author has been careful to lead into the use of mathematical methods via a full explanation of the reason for their adoption.

After an initial consideration of control systems, the various types are analysed, with reference to the problems of stability. The transfer stages which occur in all systems are then considered, and next the equations for the various types of control are developed. A subsequent group of chapters deals with the plant controlled and the transmission system between it and the controlling apparatus, and the analysis of plant and of controlling units is discussed. The purpose of this book was noted at the beginning of the review: it remains only to say that it fulfils it admirably. Published by Chapman and Hall, 285 pages, 8½ in. by 5½ in. Price 30s.

BOOKS RECEIVED

Manual Lifting and Handling. Booklet applying to problems of lifting by hand in industry, etc., the basic principles of weight lifting as developed by physical culture experts. Intended for supervisors and training officers. Published by the Industrial Welfare Society, 48 Bryanston Square, London W.1. Price 2s.

Refrigeration Insulation, by G. Yate Pitts. Essentially practical treatment of problems arising. Published by "Modern Refrigeration," Empire House, St. Martin's-le-Grand, E.C.1. 47 pages, 8½ in. x 5½ in. Price 7s. 6d.

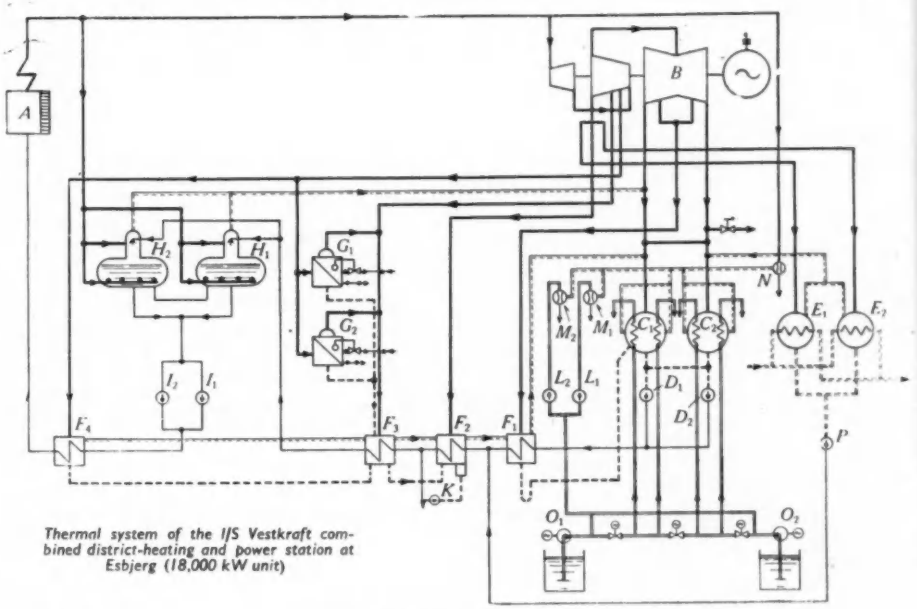
District Heating in Denmark

Largest pass-off turbo to be installed at Esbjerg

DISTRICT heating has a long and satisfactory history in many parts of Denmark, and installations vary from large cities to comparatively small towns. In some plants the exhaust heat from Diesel engines, which until recent times were installed in every town for local power supply, was utilised. Since, however, the general power supply has been taken over by the larger-sized thermal stations, efforts have been made to harness them for district heating as well in so far as the site of the station ensured that distribution losses would not be excessive.

An interesting example of combined generation and district heating is that at Esbjerg and is detailed in the Brown Boveri Review for October. As long ago as 1939 the United Electricity Supply Authority of S.W. Jutland commissioned a thermal station containing an 8,000 kW condensing and a 1,500 back-pressure turbo-alternator, with the latter arranged to supply heat for district heating. This station was taken over towards the end of 1945 by the I/S Vestkraft, and at the same time an extension of the plant was decided upon. Brown Boveri was, therefore, entrusted with the supply of an 18,000 kW set designed for modern steam conditions of 925 lb/sq in. at 932° F at the inlet valve. Since the power station is located on the coast, seawater having a mean temperature of 50° F is available for cooling purposes.

This two-cylinder machine is provided with several extraction points for feed water heating and its design is such that about 70 tons of steam/hr can be taken from the l.p. cylinder and used for the indirect heating of water in the district heating system of the town. Since the demand from the district heating system varies



Thermal system of the I/S Vestkraft combined district-heating and power station at Esbjerg (18,000 kW unit)

A = Boiler
B = Turbine
C_1, C_2 = Condensers
D_1, D_2 = Condenser pumps
E_1, E_2 = Heat exchangers
F_1-F_3 = L.P. feed heaters
F_4 = H.P. feed heater
G_1, G_2 = Evaporators
H_1, H_2 = Feed-water tanks
I_1, I_2 = Feed-water pumps
K = Feed heater condenser pump
L_1, L_2 = Ejector pumps
M_1, M_2 = Ejectors
N = High-speed deaerator
O_1, O_2 = Circulating water pumps
P = Condensate pump for heat exchanger

— = Steam
– – – = Condensate
— = Feed Water
= = Circulating water
▲—▲—▲ = Raw water
. — . — . = Sludge
= = Air
= = = = Heating water

D

with the season, the turbine is fitted with by-pass valves at the extraction point, so that a constant heating temperature can be maintained irrespective of the electrical output of the plant. By running in parallel with other power-stations it is also possible to adapt the electrical output to the relevant requirements for district heating so that throttle losses are minimised Steam passes from the extraction point to the heat exchanger through two 24 in. dia pipes.

This set was first put into service towards the end of 1948 and has been running continuously with district heating in operation, as there is always a demand for hot water irrespective of the time of year.

A Larger Unit

An order for a second machine with a capacity of 36,000 kW was also placed with Brown Boveri in 1949. The live steam conditions of this machine are the same as for the previous unit, but instead of being a two-cylinder tandem set, it is a three-cylinder unit. In this case a somewhat different extraction system is used. Two oil-pressure controlled throttle valves are built into the steam transfer pipes connecting the i.p. and l.p. cylinders. Preceding these are the pipes leading to the heat exchanger for heating the water for the district-heating scheme. From this machine also, the total quantity of steam flowing through the admission valves (135 tons/hr at full load) can be extracted. It is believed that this is the largest turbine ever designed for full steam extraction.

The blading of both turbo-alternators is designed for high efficiency even when steam is not being extracted, as one of them has to run as a straight condensing turbine for six months of the year.

SULPHUR HEXAFLUORIDE

A New Synthetic Gaseous Dielectric

SULPHUR hexafluoride, which has been available for some time in America, is now available in this country from I.C.I., as a liquified gas in steel cylinders. It is a dense gas (6 grams/litre at atmospheric temperature and pressure), colourless, odourless, tasteless and non-inflammable, and has been shown to be stable when heated to 500° C, and when dry has no effect on steel, copper or aluminium. It is, however, its electrical properties that make it valuable to industry and research, as its breakdown strength has been reported to be two to five times that of air, depending on the condition of the tests.

At a pressure of 3 to 3½ atmospheres absolute sulphur hexafluoride has approximately the same breakdown voltage as transformer oils. Where weight is important, as in aircraft transformers, sulphur hexafluoride can be expected to take the place of oil as an insulating medium. Nitrogen and difluorodichloromethane, Arcton 6, are used as insulating gases and, like them, sulphur hexafluoride is "self-healing" after breakdowns. Sulphur hexafluoride, however, has the advantages over both these gases in dielectric strength, thus enabling smaller and more compact units to be made. Other advantages over the halogenated methanes are that no carbon can be deposited from sulphur hexafluoride after breakdown, so that tracking is minimised. Because of its physical properties, boiling point —61° C, critical temperature 45° C, sulphur hexafluoride at 30 lb per sq in. pressure can be used down to —40° C without condensation.

Both here and in America sulphur hexafluoride is used for high-voltage X-ray equipment and for very high-voltage electrostatic generators such as the Van de Graaf generators, allowing a higher voltage to be generated on a given machine. Gas insulated cables using sulphur hexafluoride can be operated at a lower pressure than those filled with nitrogen for a given voltage; alternatively a higher voltage can be employed.

The fact that sulphur hexafluoride is now available in this country will enable research organisations and designers to try out new applications for this gas, the uses of which are only just beginning to be investigated.

Sulphur hexafluoride itself is non-toxic, but the lower fluorides of sulphur are known to be toxic. Experiments have shown that about 1% of sulphur hexafluoride gas is decomposed when it is exposed to an hour of continuous arcing. Until more experience has been gained it must be assumed that the breakdown product will contain lower fluorides of sulphur, thus creating a hazard which will have to be considered when sulphur hexafluoride is subjected to this treatment. Under normal conditions of laboratory and works use of sulphur hexafluoride is considered by many workers to be as harmless as nitrogen, but it should be treated with the respect which is due to all new chemicals.

The BUYER'S *Column*

An Automatic Door Switch

NOW in production by ARCOLECTRIC (SWITCHES) LTD., Central Avenue, West Molesey, Surrey, is a new automatic door switch.

It has been designed especially for door operation in refrigerators, wardrobes, cupboards, etc. It is also suitable for use as a courtesy light switch in cars and for certain uses as a limit switch.

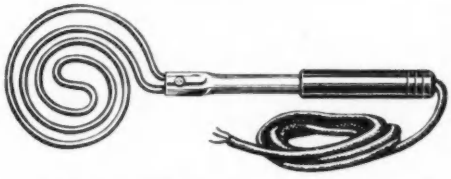
Catalogue No. S.930, listed 3s. each, is rated 1 amp 250 V and is designed for fixing in a single ½-in. hole. It is biased normally "on," a small depression breaking the circuit. The rest of the movement of the push is "over-run."

All current-carrying parts are heavily silver plated. Simplicity of the design (slow make-and-break) should give a long life for the switch.

The Harlie Electric Poker

AN electric firelighting device has been marketed by STORR SUPPLIES, LTD., Balham Road, Edmonton, London, N.9, it is the "Harlie" firelighter which we have illustrated.

Seventeen inches long the unit is designed to sell at 60s. complete. It is for 200/240 V supplies either d.c. or a.c. The method of operation is



simple. Place the lighter on a layer of small coal then cover with more coal, switch on for 7 to 10 minutes until the coal is alight. Switch off the lighter but leave in position to allow all stored heat to be disseminated and remove. The element is similar to the normal radiant hot plate element and is rated at 960 W.

Boon to Beekeepers

AN electrically-heated knife for uncapping honeycombs, now on the market, will without doubt prove a great asset to beekeepers throughout the country.

Manufactured by RUTLAND APIARIES, Glaston, Uppingham, the knife has a double-edged steel blade 9 in. long, 1½ in. wide and is chromium plated for hygiene. The blade has a convex surface which enables the cappings to drop clear and not adhere to the comb. Supplied with insulated Bakelite handle and 9 ft of 3-core cable, the knife has an element rated 70 W enclosed in a steel pressing and for operation on 210/240 V a.c. supplies. Price is 57s. 6d.

Transformers and Equipment

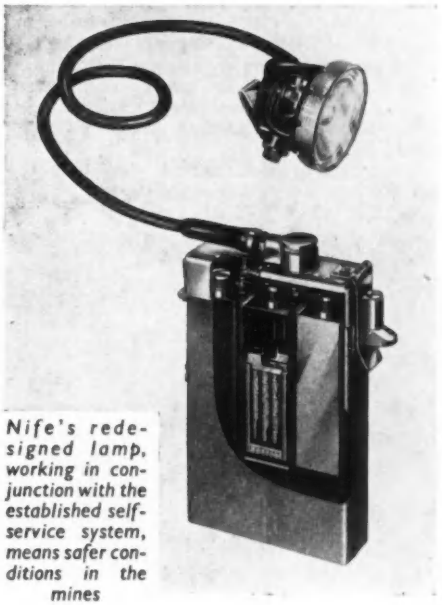
IN a reference to the equipment made by the TRANSFORMER AND ELECTRICAL CO., LTD., Eastern Works, Eastern Road, Walthamstow London, E.17, in our issue of November 29, there was an error.

The range of transformers made by the company includes 10 VA and *100 kVA* units not 100 VA as we noted.

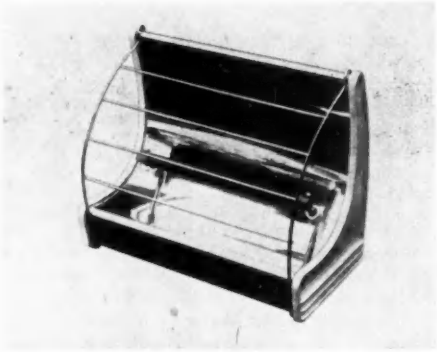
Redesigned Nife Cap Lamp

THE recently redesigned Nife alkaline battery-powered miners' caplamps and their now established system of controlled self-service in colliery lamp rooms, are described in a new publication, No. 4451, by NIFE BATTERIES, of Redditch, Worcs. The object of these innovations was to ensure the utmost simplicity and reliability in the lamp, the minimum of lamp room staff and the maximum of smooth, efficient service.

The new headpiece, produced in featherweight toughened plastic, now possesses many fewer components, and the electrical circuit, using pure silver contact points to minimise voltage drop, has become simplicity itself. A particularly interesting feature of the lamp is its combined "Perspex" bezel and lens. This one-piece, almost unbreakable, moulding replaces three components in a headpiece of orthodox design, reduces glare and provides a 10% increase in mean spherical c.p.



Nife's redesigned lamp, working in conjunction with the established self-service system, means safer conditions in the mines



Falco's New EF40 Fire

RECENTLY released to stockists despite the current (and temporary, it is hoped) bias against the use of these appliances, is the EF40 reflector fire, built by FALCO ELECTRICAL APPLIANCES LTD., Corporation Rd., Audenshaw.

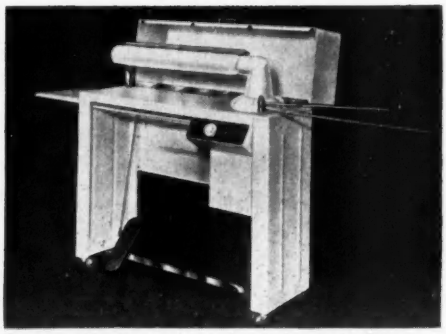
It has cast iron sides finished in cream enamel, with a polished aluminium reflector. The element is rated at 1 kW and is fitted with a chromium plated removable dress guard.

Fitted with the standard length (4½ ft) of 3-core flexible cable, the fire is for use on 200/220 V and 230/250 V. Overall dimensions are 12½ in. length, 10 in. high and 6½ in. deep. Price is £2 6s. plus £1 13s. 10d. purchase tax.

The Oprim Industrial Ironer

THE "Oprim" industrial model rotary ironing machine which has been marketed by AIRCRAFT AND GENERAL ENGINEERING CO. LTD., Albion Works, Park Way, Edgware, Middlesex, is a unit which is ideally suitable for garment and cloth manufacturers, the hosiery and curtain trades, catering organisations and all other industries where a considerable amount of ironing is carried out regularly.

It is a self-contained, cabinet type, all-electric unit, foot-operated and designed for constant use.



The neat Oprim model makes light work of ironing

Infinitely variable heat control is fitted, controlled by an element selector switch.

The motor is controlled by a switch, permitting its use as a press iron. Stove enamelled in white or cream with all steel parts in polished chrome, including the ironing shoe, the unit has all working parts totally enclosed and is mounted on castors for easy manoeuvrability.

Overall dimensions are 37½ in. long by 15 in. wide by 28½ in. high. The roller is 24 in. long by 3 in. diameter. For 200/220 V 230/250 V a.c. supply, with a total loading of 1,850 watts, the unit is priced £89 15s. tax free.

The Humidification of Mills and Factories

THE West Riding of Yorkshire became the centre of Britain's woollen industry principally on account of the climatic conditions which

Good working conditions are ensured by the use of the Aromist

were unusually favourable for wool processing. However suitable the climate may be, physical conditions vary considerably in wet and dry weather and in winter and summer according to the time of day. In order to provide a consistent atmosphere which would help the textile processes and the industry generally to keep up a high level of production INDUSTRIAL HUMIDIFIERS, LTD., Anchor Works, Leicester, have developed a unit which they believe provides the best method of humidifying working spaces.

The "Aromist" humidifier is designed to inject into the atmosphere the degree of moisture required to maintain the best working conditions for the material and the health of the work people. Each unit is designed to condition a space of 15,000 c. ft. The outer container holding five gallons of water also encloses the mechanism. This comprises a metal cone dipping into the water through which water is drawn into a chamber; and expelled through small tubes against a ring of fine gauze and the resulting fine vapour is expelled into the room through spray outlets. The unit is operated by an ⅛ h.p. a.c. motor which drives the fan and also the cone "pump syphon."

STEADY FURNACE CONTROL

Electronic unit compensates for voltage variation

CONTROL of electrically heated furnaces by resistance-thermometer is rendered particularly difficult in these days of generating plant shortages by voltage and frequency variations in the mains supply. In an effort to overcome this problem with the simplest possible equipment, Sunvic Controls, Ltd., have recently introduced a new type of two-valve controller (type RT2), which incorporates a Sunvic energy controller in the output circuit of the controller to compensate for the effects of change of voltage.

Working Principle

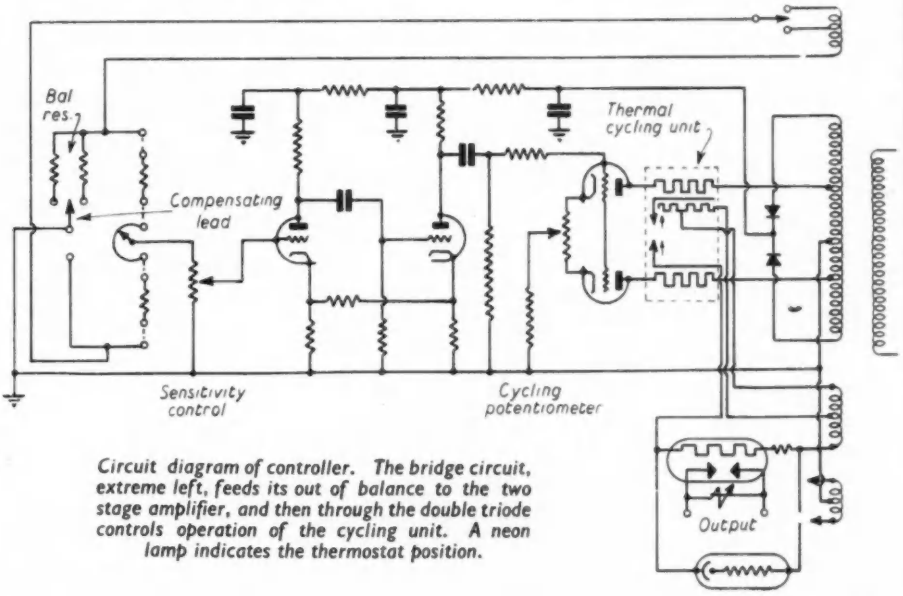
The controller is designed to work with a platinum resistance thermometer as the temperature sensitive element, this being connected in one arm of an a.c. resistance bridge, the balance ratio of which is varied by a potentiometer. This potentiometer sets the controller to the required temperature. Any out-of-balance from the bridge is amplified by a two-stage RC coupled amplifier, and applied to a thermal cycling energy regulator unit operated by a double triode.

In this cycling unit, two bimetal strips are arranged, fixed at one end. The free end of each strip carries a contact, and the strips are arranged to move in the same direction on increase in temperature. Each strip carries a heater winding connected in the anode circuit of one half of the double triode, and the anode supplies of these halves are in anti-phase. With no signal, the strips are parallel to one another, but when a signal is applied due to the bridge unbalancing, one valve will begin to conduct, which depending on whether the thermometer resistance has risen and fallen. As a result, the strips move towards or away from one another, depending on the sense of the signal received.

The thermal cycling unit proper has a hot wire vacuum switch in series with a supply transformer and a second heater winding on one of the two bimetallic strips; its operation provides the proportional action of the controller. Part of the bimetal heater winding mentioned above is connected directly to a secondary winding on the main transformer, and provides compensation for supply voltage change as far as the uncontrolled part of the load is concerned.

Both the valves used in the controller are of a standard industrial type, and no electrolytic capacitors are involved. The controller as a whole is arranged for mounting in a standard P.O. rack, the front plate being half standard rack size. Mains consumption is about 15 W, and the load handled is 11 A at 100/130 V or 9 A at 200/250 V.

It is claimed that this new controller, by permitting the use of a wide proportional band without excessive control point movement, makes possible the use of a simpler type of furnace design.



Circuit diagram of controller. The bridge circuit, extreme left, feeds its out of balance to the two stage amplifier, and then through the double triode controls operation of the cycling unit. A neon lamp indicates the thermostat position.

THE WEEK

COMMERCE *in news* COMMERCE

News for Contractors

A REMINDER of the agreements affecting wiremen, etc., covering Christmas and New Year holidays has been circulated by the National Federated Electrical Association. Christmas Day is a paid holiday in all areas, and operatives called upon to work on that day are entitled to pay at double time and a day off in lieu for which they shall be paid at normal rates. Boxing Day is a paid holiday everywhere except in Bolton, Lancs. In that town, December 26 is an ordinary working day, with pay at bare-time rates. Elsewhere, operatives who have to work are entitled either to pay at time and a half plus a day off in lieu, or, at the discretion of the employer, two and a half times bare-time rates in which case no day off is given.

New Year's Day is an ordinary working day except in Blackburn and Bolton, where it is a paid holiday, with payment as for Boxing Day in other areas. In regard to Monday, December 24, the Association stresses the need to give early notification to employees where it is decided to close down. Notice has also been received of an amendment to the articles of the Association, limiting the liability of N.E.C.T.A., Ltd. in respect of any one contract entered into by the member concerned to £500.

Abolish P.T. urges Brighton Firm

THE new Chancellor of the Exchequer, since he assumed office in October, has been the recipient of numerous appeals for the removal of purchase tax on domestic electrical equipment both from inside the House and outside. He may well receive another shortly from four M.P.s who have been contacted on the same matter by J. R. Morgan (Brighton) Ltd. In a letter last week, that company states they know of several firms who are in dire financial straits because of the heavy tax on many of these appliances. It cannot be considered a luxury tax, the letter reads, nor can it benefit the country if firms in the industry were hard hit by the imposition. If it is intended to curb spending at home, could not a certain percentage of goods be allocated to the home market?

Indian Radio Show Postponed

IN VIEW of the critical situation existing in the State of Bombay following the failure of the monsoon, the consequent drastic cuts in supplies of water and electricity and the possibility of the worst famine for 50 years, it has been decided to postpone the International Radio and Electronics Exhibition of India. As announced some months ago, the exhibition was to have opened on February 9, but it will now be held between November 10 and 30, 1952. The organisers, faced with circumstances beyond their control, will nevertheless invite the continuation of bookings already established and continue with arrangements. The enquiries will be received by the London Liaison Committee's Secretary, Mr. B. A. Pettit, at 41 Kingsway, W.C.2.

Heavy Bookings for Pakistan Fair

FURTHER to our report a fortnight ago concerning the Pakistan International Industries Fair, 1952, we now learn that arrangements for the U.K. "National Pavilion" have been completed, and further applications for space in that section cannot be accepted. The Fair is to take place between March 1 and April 6. Space is still available, however, in the Trade Fair Section, and applications in that respect should be submitted to Mr. S. J. Jamil, Madha Chamber, Bunder Road, Karachi 2.

Report on Wiring in Prefabs

MANCHESTER City Council, at their meeting last week, received the reports of the Town Clerk and No. 1 sub-area of the N.W. Electricity Board concerning the wiring system of prefabricated houses on one of the City's estates. It will be recalled (see our October 25 issue) that following a fire in one of those bungalows, residents peti-

The First Half-Century

On Tuesday last I had an opportunity of seeing the new incandescent lamp invented by Messrs. Crawford and Voelker, and manufactured at present in the laboratory of Messrs. Maguire and Baucus in Sardinia Street. The filament of this lamp is of titanium carbide, and is very tough and elastic. It is also much shorter than a carbon filament for the corresponding voltage. We, that is myself and a colleague, tested several lamps of voltages ranging from 100 to 500 volts and found the watts per candle to vary from 2.1, for the 100-volt lamp, to from 5 to nearly 7 watts per candle for the 500 volt. This last was, of course, quite in the experimental stage, and the wonder was: not that it was uneconomical, but that it could be made at all. The only 200 volt lamp tested gave an efficiency of 2.5 watts per candle.—*From our issue of December* 12, 1901.

tioned the Council to examine the wiring, which they alleged was faulty, and the master switches, which, it was stated, were in an unsafe position. The Board accordingly carried out an investigation.

They reported that it was impossible to establish the cause of the fire due to extensive damage done, but they discovered that the fuses had been rewired, presumably by the tenant, and the wire used afforded no protection to light-duty socket outlets. It was emphasised that the number of fires in prefabs was no greater than in permanent houses. Four suggestions were made as a future safeguard. It was recommended that an inspection and test of all installations and appliances should be carried out annually; socket outlets and associated wiring where condensation existed should be resited; deteriorated fittings and accessories should be replaced; and that instructions be issued pointing out the dangers of unauthorised extensions and replacements.

The report also contained a reminder of the controversy which arose when these temporary bungalows were first built, but added that although electricity authorities were not satisfied with the installations, it would be a costly business to make alterations now.

High Voltage D.C.

VAN DE GRAAF pressurised electrostatic generators were described in a paper presented to the London Students' Section of the I.E.E. on Monday by Messrs. D. H. HARRIS, B.SC.(ENG.) and R. J. RYAN, B.SC.(ENG.) After dealing with the theory and operation of such machines, they went on to describe the unit being operated at Queen Mary College, and to detail the experiments that are being made there on such matters as the belt material and the gaseous dielectric for the accelerator tube.

In their concluding sections the authors described some of the applications of Van de Graaf machines, and stated that it was now possible to build, in a comparatively confined space, machines capable of producing 5 MV at 1 mA with a stability of better than 1%.

Appeal for Catalogues

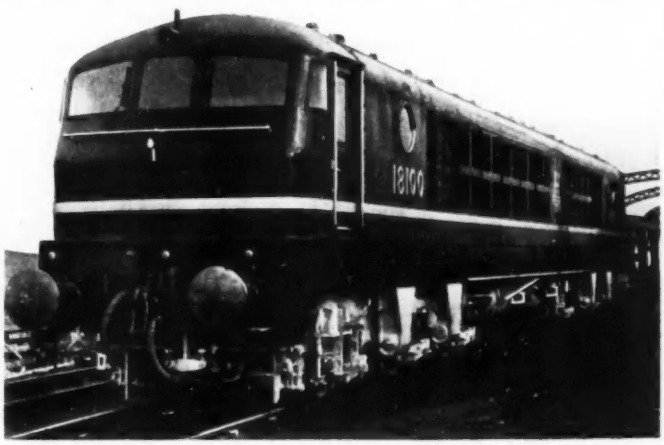
IT IS not often we refer here to our advertisements but on page 43 of this issue M.K. Electric Ltd. are making an appeal to the industry in their Christmas advertisement for old catalogues. Some of the company's oldest catalogues have become a pictorial history of developments in the manufacture of small electrical accessories. In asking readers to send the oldest catalogue they can find —they expect to receive those published in 1919 or 1920—M.K. are hoping to obtain one copy which is missing from their own records. Incidentally, the original name of the company was The Heavy Current Electric Accessories Co., and the letters M.K. were the initials of the first patent, taken out in 1919, the "Multy-Kontact" socket.

Supply of Medicine to Factories

THOSE concerned with first-aid rooms in factories will no doubt be interested to learn that the Commissioners of Customs and Excise have reviewed conditions under which tax-free dispensing packs of proprietary or branded preparations of official drugs or medicines may be supplied. They have decided that where a factory claims entitlement to receive dispensing packs tax-free, orders for the supply of drugs must be authorised by the doctor and consigned to him at the works or elsewhere.

Lord Citrine talks to E.P.E.A.

THE London Combined Sections of the E.P.E.A. were a little more subdued than usual at their meeting last week when they were addressed by Lord Citrine. He spoke of the early days of the E.T.U. and E.P.E.A. and outlined the organisation set up within the industry for negotiations and consultation. The unions, today, have far more information at their disposal as to the working of the supply industry than they had ever had. He



The first British-built oil burning gas-turbine locomotive manufactured by Metropolitan-Vickers Electrical Co., Ltd., will shortly be delivered to the Western Region of B.R. It will be the second to be commissioned in this Region as a Brown Boveri unit has been running on regular services for the past year. This latter locomotive was built in Switzerland

Some idea of the lighting installation carried out may be gained from this night view of the new factory of Bridgend Paper Mills, Ltd., at Llangynwyd. Skilful control of massing and fenestration was achieved, coupled with the use of glass as a constructional material. All lighting equipment was supplied by the G.E.C., Ltd. Some details of the installation were given in our July 26 issue

mentioned that education was required at every level of the industry. Speaking for the Board, he said that constructive criticism was welcomed. After the talk a number of questions were put to Lord Citrine.

Next Year's T.V. Convention

FURTHER details of the Television Convention, to be held in London between April 28 and May 3 next year, have been given by the I.E.E. It is entitled "The British Contribution to T.V." and will be divided into nine sessions covering all aspects from programme production to the viewer. There will be demonstrations of equipment, and between 60 and 80 papers will be given. During the week also visits have been arranged to B.B.C. studios and the latest transmitters, the P.O. Research Station, the terminal of the London-Birmingham co-axial cable link and to certain commercial organisations. Any interested persons who have not yet applied and require details are advised to contact the secretary of I.E.E. as soon as possible. Overseas visitors will be especially welcome.

OFFICIAL PUBLICATIONS THIS WEEK

DEVELOPMENT BY LOCAL AUTHORITIES AND STATUTORY UNDERTAKERS. H.M.S.O., price 6d. *Circular and Memorandum issued by Ministry of Housing and Local Government on revised planning permission procedure; applies to B.E.A. and electricity boards.* (*See page* 1059).

BRITISH STANDARDS.
*B.S.*108: *Graphic Symbols for General Electrical Purposes—Revision. Amendments PD*1271 *to B.S.*376: *Railway signalling symbols. PD*1279 *to B.S.*148: *Insulating oil. PD*1288 *to B.S.*174/181: *o/h live wire material.*

CODES OF PRACTICE.
*CP*407.101. *Electric Lifts for Passengers, Goods and Service* (4s.). *PD*1301. *Addendum to CP*321 *and CP*321.101, *on use and protection of aluminium and zinc alloy fittings.*

TELEPHONE REGULATIONS, 1951. H.M.S.O., 2s. *S.I.*2075—*Telephone Act*, 1951.

TELEPHONE (REVOCATION) REGULATIONS, 1951. H.M.S.O., 2d. *S.I.*2074—*Telegraph Act*, 1885.

E.R.A. REPORTS.
F/T 172. *Cathodic Corrosion of a Lead Cable Sheath* (*price* 9s. 6d.); *G/T* 257. *Intrinsically Safe Apparatus. Relation of igniting current to circuit inductance for inflammable mixtures with air of carbon monoxide, coal gas and hydrogen* (*price* 7s. 9d.); *L/T*214. *Electric Breakdown of Gases at* 2,800 *Mc/s* (*price* 18s. 4d.) (*obtainable from E.R.A., Thorncroft Manor, Dorking Road, Leatherhead*).

NORTH WALES HYDRO-ELECTRIC POWER BILL. *To confer powers on B.E.A. for constructions in Caernarvon and Merioneth.* (*Obtainable from Parliamentary Agents, Dyson, Bell and Co., 15 Gt. College St., S.W.*1; 2s.). (*See page* 1074).

Stella's New Showcard

THIS attractive new window display card, produced by the Stella Lamp Co., Ltd., is now available to dealers on request. It occupies an area of approximately 10 by 7 in. and has a fold-in stand slotted to hold a standard 60 W lamp. The surrounding frame, in royal blue, bears the now familiar slogan "Stella the Reliable Lamp" in white lettering.

Plymouth Club Well Set

WE HEAR that the newly formed Electric Club in Plymouth is progressing satisfactorily, with a membership of about 50 at present and growing steadily. Considerable work has been done since electrical engineers in the district met last August to discuss such a club. President of the club is the Earl of Mount Edgcumbe and its chairman is Mr. P. S. Heath. The hon. secretary is Mr. G. B. Hayward. We learn also that a special club badge has been designed by a member, Capt. E. W. Porter of the R.E.M.E.

I.E.E. Meeting—Date Changed

IN ORDER to avoid clashing with another function on January 24 next, the I.E.E. (London) Utilization section's meeting, previously arranged for that evening, has been brought forward a week. Mr. H. W. Swann will now present his paper entitled "Domestic Electrical Installations: Some Safety Aspects," on Thursday, January 17. Time and venue remain unaltered.

Consultative Council in N. Wales

HAVING heard the chief commercial officer of Merseyside and N. Wales Board, Mr. W. Gilchrist, say that all money allocated for rural development up to March 31, had been spent, the Area's Consultative Council passed a resolution viewing with concern any interference with the rural development programme. The council's chairman said that in the event of any interference with rural development strong representations would be made to those responsible.

. . . in the North West

THE above Consultative Council's neighbours in the N.W. Area will shortly be considering a suggestion by a Trafford Park industrialist that new houses should be wired for lighting and low-wattage appliances only, gas being supplied for heating and cooking. Warning against the adoption of this plan recently, Mr. H. G. Bell, of N.W.E.B., said it would eventually force up the price of electricity because of the high cost of new generating plant.

. . . and in the Midlands

AN opinion that office accommodation at power stations was "rather palatial," was expressed by a member of the Midlands Consultative Council recently. A local committee requested that generation costs, particularly those relating to offices, should be investigated, as it was advisable to bring about economy wherever possible with a view to reducing costs. Several members said it was only fair that employees should have proper amenities. It was agreed, however, that the committee's recommendation should be passed to the Board.

Development of Colyton

AN electrical exhibition in the town hall at Colyton provided an admirable review of remarkable progress in development in that small rural district of S.W. England. During the opening ceremony, tribute was paid to the firm of Hann and Sons, who were responsible for bringing a supply to Colyton 30 years ago, and it was disclosed that since nationalisation the S.W. Board had invested about £25,000. Electricity on the farm was of course a feature of the exhibition, and prospects for increased amenities in that field were excellent, while in other directions they appear no less propitious. Early in the new year Colyton is likely to have a new system of street lighting.

One of the new fork-lift trucks being used now by the Port of London Authority to move innumerable cases of tobacco at the docks. They were made by Greenwood and Batley and powered by Exide-Ironclad batteries of 14 IMV-15 H cells, capacity 226 Ah at the 5-hour rate

A corner of the exhibition at Colyton (Devon) town hall showing a transformer, cable joints, and oil circuit-breakers—an unusual exhibit in as much as it shows how electricity reaches the consumer rather than how the consumer can use it

Large Sound Equipment System

THE sound equipment system installed a short time ago in the Nottingham factory of John Player and Sons, the tobacco firm, by G.E.C., is claimed to be one of the largest industrial systems of its kind in England. It comprises four 500 W high-fidelity amplifiers which transmit Music-While-You-Work programmes to about 500 loudspeakers. Wiring of the installation required some 42 miles of wire, with a main 100-way cable leading from the control room, which incidentally is in the company's former A.R.P. room. The 80 loudspeaker circuits are grouped up and paralleled across the amplifier outputs, but there is also a cross connection panel whereby any loudspeaker can be connected to any amplifier.

An unusual aspect of the installation is that it is linked to a 60 W amplifier which feeds 24 speakers in a works situated in another part of the city.

Economy Committees set to Work

THE Peak Economy Committees set up throughout the country a few months ago have settled down to their allotted tasks. At a meeting called by one of these committees at Bournemouth recently, a local resident gave her views on how to effect domestic economy. She suggested switching on immersion heaters at night only, instructions to women moving into "electric homes," and

classes in local schools on economic use of equipment. Other delegates proposed that hoteliers should post official warning notices lest customers thought the proprietors were merely trying to save money, and that public offices should set an example by seeing that electric fires were never full on in overheated rooms. Delegates agreed that schemes for practical instruction in economy should be instituted.

Library of Catalogues

A CATALOGUE library containing literature of more than 3,000 firms, and a complete set of British Standards, has been opened at the Engineering Centre, 351 Sanchiehall Street, Glasgow. We understand that the facilities offered by the library have already been put to good use by consultants, draughtsmen, and buyers, as well as by many overseas visitors. The Centre's own technical staff constantly supervise additions to the catalogues to ensure that the library contains the most recent publications, and manufacturers who have not included the Centre on their mailing lists for publicity matter, are invited to do so.

NEWS IN BRIEF

Following our report of the Argentine Ambassador's visit to Automatic Telephone and Electric Co. (Nov. 29 issue) we note that Senor Don Carlos A. Hogan has also been the guest of B.I.C.C. Ltd. at their Prescot works.

A half-inch scale model of the high-pressure water-tube boiler plant nearing completion at Pyrmont power station, Sydney (N.S.W.) is being exhibited at the London offices of International Combustion Ltd. Later, the model will go to Australia and then for use for instructional purposes in the Commonwealth.

Hoover (Electric Motors) Ltd. will nearly double the size of their factory at Cambuslang, Glasgow, when the new extensions are brought into operation shortly to help cope with the demand for f.h.p. motors.

At the recent annual meeting of Electrical Trades' Commercial Travellers' Association the allocation of money from the Benevolent Fund was granted as follows : E.I.B.A., £350; Royal C.T. Schools, £225; C.T. Benevolent Institution, £2 2s.; and I.E.E. Benevolent Fund, £5 5s.

A new radio-telephone service was opened last week by Cable and Wireless Ltd., between Hong Kong and N. Borneo.

Nearly 100 foremen and guests attended the fourth annual dinner of the Foremen's Section of Telcon Staff Association, held recently.

Simplex Electric showed three Creda heavy-duty cooking units at the recent conference and exhibition held at Cheltenham by the British Hotels and Restaurant Association. The display formed an excellent preview for the next Hotel and Catering Exhibition at Olympia.

The thirty-sixth annual report of St. Dunstan's for the year ended March 31 last has been published and contains much interesting information on the remarkable capabilities of the blind.

Eighty-eight members of the Works' Relations Group of the London branch of I.S.M.A. recently visited the Perivale factory of Hoover Ltd.

Questions in Parliament

Incorrect Answer—No Report Yet

Mr. Geoffrey Lloyd, in a written answer, told the House he was not yet in a position to report on the inquiry into the extent to which any official of his Department was implicated in the incorrect answer given regarding the Y.E.B. The investigation, he said, would take some little time.

Municipal Supplies?

Mr. Hylton-Foster asked last week whether the Minister of Fuel and Power would give municipalities an opportunity to put forward their claim to re-enter the field of electricity generation and distribution. The Minister stated, however, that he was not in a position to make a statement.

Waste of Money?

During the debate on defence, Mr. Charles Orr-Ewing had a word to say about the finish on radar equipment. He asked whether they were getting the best value for money spent on defence, and instanced that equipment, which in the old days used to be sprayed a matt black. Nowadays, he said, everything had to have chromium fittings and a high gloss finish. Present-day cost of finishing to the old standard was £10; the new was £65. Not only was it money going down the drain, but it was absorbing skilled manpower.

Technical Education

Asked what effect proposed building economies would have on technical education, the Minister of Education said the whole educational building programme was under review and she could make no statement at present.

Guards on Fires

The Heating Appliances (Fireguards) Bill, a private members' Bill, was read a first time last week. Its object is to prohibit the sale of certain heating appliances including electric fires without an effective fireguard. It is scheduled for a second reading on March 14.

H.E. Scheme for Snowdonia

The subject of "National Parks" was debated on a motion for the adjournment last Thursday. It was introduced by Dr. Barnett Stross, who said that if the N. Wales hydro-electric schemes were fully carried out by the B.E.A., Snowdonia would be only a pretence of a park. He urged those responsible to bear in mind all the interests concerned and keep a close watch on developments. Dr. Stross asserted the House generally agreed

that where the parks were most used and most beautiful, transmission lines should be underground. He then submitted that the higher cost should be borne nationally, in which case the increase to consumers would amount to only one-thousandth of a penny per unit. If this were not acceptable, Dr. Stross suggested the money be obtained from the National Land Fund.

Boiler Specifications

Asked by Mr. Hobson at what steam pressure and superheat temperature boilers were being supplied to the B.E.A., the Minister of Fuel and Power referred to the Authority's third annual report. Mr. Hobson said he had anticipated that reply, but the information there was not quite correct and there was ample evidence that Statutory Order 2596, passed in 1947, had not been complied with. The Minister retorted that he would like notice of that question.

(There appears to be some doubt as to whether Order 2596 was the one Mr. Hobson meant to refer to in his question.)

Comparative Coal Stocks

Mr. Geoffrey Lloyd gave the following comparative figures for coal stocks held in this country in November of 1949, 1950 and 1951 (those for this year are only estimated):

	Thousand Tons		
	1949	1950	1951
All industry	4,385	4,137	5,189
Gas	2,852	3,109	3,233
Electricity	4,476	3,988	5,261
Coke Ovens	811	765	950
House Coal	2,346	1,939	1,216
Other consumers ...	1,448	1,081	1,301
Total	16,318	15,019	17,150

Progress on Fuel Policy

The Minister of Fuel and Power told the House last week that the committee formed last July to investigate wider aspects of national fuel and power policy were studying a large amount of technical and economic information, but it was not possible to say when the final report could be expected. He would consider whether the report could be expedited. The committee had been asked to submit interim reports when practicable. The Minister also stated that the committee was consulting prominent industrialists and fuel technologists as well as taking evidence from the Ministry and nationalised boards.

Factory Generating Plant

Mr. G. Nabarro asked the Minister of Fuel and Power what the Government's policy was concerning the installation of generating equipment, particularly including auto-diesel sets, back-pressure turbines and reciprocating engines, at factories, for use independently of mains supply. He also asked whether the Minister was satisfied that the B.E.A. had removed all discouragements and restrictions in this respect. Mr. Lloyd replied, however, by saying he was looking into the matter and could not make a statement at present.

Increased Generation and Coal Supplies

In a lengthy reply to a question last week, Mr. Geoffrey Lloyd gave some details of planned additional output of power stations during 1951 and 1952, extra coal required and plans to assure proper balance in capital development between N.C.B. and B.E.A. He said the plan approved for the B.E.A. was to commission 1,100 MW this year and 1,250 MW next, which, having allowed for plant going out of service, should give a net addition of 1,000 MW in 1951 and about 1,100 MW in 1952. Raw materials shortages and defence needs might prevent the attainment of these targets, but at least 1,000 MW of new plant would be commissioned this year.

Power stations consumed 31½ million tons of coal in 1950, he continued, and estimates for this year and next showed consumption of about 35 million and 38 million tons respectively. This increase would, however, be less in proportion than the increased supply of electricity produced. If there was no increase in demand the introduction of new stations would result in less coal being consumed. Mr. Lloyd illustrated this by stating that a full year's working of the 1,000 MW of plant which it was hoped to commission this year would effect a net saving of 300,000 tons of coal, and a full year's working of the 1,250 MW planned for 1952 together with the 100 MW left over from 1951 would give an additional net saving of about 500,000 tons. Referring to the last point raised, Mr. Lloyd said programmes of development of both the Coal Board and B.E.A. were settled in consultation with himself and it was easy to ensure that there was a proper balance.

S.W. Scotland Board's Future?

When asked whether in view of the fact that Mr. J. S. Pickles had left the S.W. Scotland Board to take up his post in Yorkshire, it would be a good opportunity to put it under the Secretary of State for Scotland, Mr. Lloyd gave a non-committal reply. Mr. Lloyd added that he could not say who he would appoint to succeed Mr. Pickles.

Census of Production

Asked if the Census of Production could be simplified, Mr. H. Strauss, in a written answer, stated that it was not desirable to alter arrangements for the census to be taken next year. The future programme for censuses of production was being considered by the Board of Trade.

Responsibilities of H.E. Board

When Mr. J. Rankin asked what changes in the status or functions of the N. of Scotland H.-E. Board the Secretary of State for Scotland proposed to make, Mr. J. Stuart replied that he did not contemplate any change in the present organisation of the electricity industry in Scotland would impair the special responsibilities for the Highlands and Islands placed on the Board by the Hydro-Electric Development (Scotland) Act of 1943. He added that he hoped related projects such as the development of roads and fishings into which the Board had entered, would not be interfered with in any way.

Statistics on Generation

Following his query as to the number of power stations built in the six years after both world wars, Mr. Lewis asked a similar question last week concerning electricity generated in the same periods. Replying, Mr. Lloyd gave figures for each of 13 years. They were:

	Million kW/hr		Million kW/hr
1919 ...	... 3,650	1938 ...	... 24,372
1920 ...	... 4,275	1946 ...	... 41,253
1921 ...	... 3,890	1947 ...	... 42,580
1922 ...	... 4,541	1948 ...	... 46,493
1923 ...	... 5,289	1949 ...	... 49,061
1924 ...	... 6,022	1950 ...	... 54,965

Year ended October 1951: 59,933 million kW/hr

Oil Firing of Plant

The possibility of firing new generating plants by oil instead of coal was being studied, but the use of oil appeared more helpful in regard to existing power stations, said Mr. Lloyd last week. Replying to a further question, he said it was technically possible to fire water-tube boilers by fuel oil, and that in a very acute coal situation it might have to be considered.

Uniformity of Tariffs

Concerning the uniformity of charges in tariffs for domestic supplies of electricity, the Minister of Fuel and Power said his predecessor had agreed the general principle recommended by area boards and B.E.A. to simplify and standardise methods of charge. That was required by the Electricity Act which did not demand a complete uniformity of charge.

Coal for New Stations

An additional 16 million tons of fuel would be required for power stations under construction or approved, stated Mr. Lloyd in a written answer. The old plant which was to be replaced would, however, have consumed some 21 million tons to produce the same amount of electricity. It was hoped that the necessary home coal would be available.

Supplies to North Uist

Asked what plans there were for hydro-electricity supplies to the Isle of North Uist, the Secretary of State for Scotland said there were no such plans at present, but it was hoped to distribute electricity in most of North Uist in due course. He had been informed by the Hydro-Electric Board that the survey of potential water power in the district was not promising.

Examination of Public Accounts

In a written answer last week, the Chancellor of the Exchequer told of steps to bring the accounts of nationalised undertakings before the House. He said those accounts were presented to Parliament under existing arrangements and it was open to the Public Accounts Committee to examine them. Before making other arrangements it might be well to await the report of the Select Committee which was considering methods whereby the affairs of nationalised industries could be placed before the House.

Hire Purchase Proposal

Mr. Lee asked whether the President of the Board of Trade would increase the sum of £100 as laid down in Clause 1(c) of the Hire Purchase Act, 1938, to one which corresponds to the present-day equivalent of that figure. In a written reply the Minister stated he did not intend to introduce an amendment at present.

Paid Members of Boards

Mr. J. Morrison asked whether a list could be published of all paid members of public boards of a commercial nature and of consultative councils, appointments were due to expire within each of the next three calendar years. Replying, the Prime Minister requested that Mr. Morrison should await the publication of a White Paper which would contain that information.

Proposal on V.H.F. Broadcasting

Replying to a question on the need for v.h.f. broadcasting, Mr. David Gammans stated that extensive developments could not be carried out without regard to the effect on capital investment. Until the Government had reviewed the recommendations of the Broadcasting Committee it would be premature to adopt the questioner's proposal for a committee to consider the development of v.h.f. broadcasting.

Parliament reassembles on January 29, 1952.

Electric Supply News

Malvern

The hearing is fixed for today (Thursday) in the action by the National Trust against the Midland Electricity Board, in which the Trust seeks to restrain the Board from erecting an overhead power line over part of the Malvern Hills.

North Western

The North Western Electricity Board has agreed to many modifications in the erection of o.h. lines, following representations from the Lancashire Executive of the Council for the Preservation of Rural England, Mr. P. A. Barnes, the executive's secretary, stated last week. Particular satisfaction was expressed that the scheme to provide Hoghton Bottoms, near Blackburn, with electricity had been substantially improved in this way.

Bucks

Protests are being made by the County Council and other local councils against a proposal to erect main power transmission lines through Buckinghamshire to the Midlands. It is proposed that this 275 kV line, some 80 miles in length, shall start at Elstree, and then pass through the Chilterns, running on to Staythorpe. The line will be untapped, we understand.

S.W. Scotland

The South West Scotland Electricity Board

have approved a scheme, estimated to cost £96,000, for supplying over 2,200 new houses which are being erected by Glasgow Corporation at Barlanark Housing Scheme, Springboig. Approval has also been given by the Board to a scheme, estimated to cost over £28,000, for supplying the first 400 houses which are being erected by Lanarkshire County Council as part of a large housing development at Cairns Site, Cambuslang, near Glasgow.

South East Scotland

That little matter of a mere £1,042,000 which existed in Scottish council's reserve funds prior to nationalisation has been brought to the notice of the new Minister of Fuel and Power by the South East Scotland Electricity Board. The Board has asked the Minister either to direct the Central Authority to give full credit for all Local Authority general reserves existing at vesting date to the area boards in whose areas the reserves arose, or provide for the transfer from the Central Authority to the South East Scotland area board of the investments and cash (£1,042,000) included in the S.E. Scotland local authority reserves.

This action has been endorsed by the area consultative committee; for as the chairman, Mr. W. M. Airlie, said, the new minister might take a different view from his predecessor.

The Board has also notified the Consultative Council of a proposed scale of service charges for installing cable in houses. Previously, service charges have rarely been made in Edinburgh and the Lothians, but owing to increased costs during the past year, the Board has decided to ask all housing authorities to contribute towards the cost of providing electricity supplies.

LIGHTING SCHEMES

Antrim.—Scheme has been approved for provision of 108 street lights, at the main street and sections of three roads, to be carried out jointly by the Town Commissioners and the R.D.C. Estimated cost, £18,800.

Coventry.—The Housing Committee has approved a scheme for the installation of 39 lamps at Fletchamstead Estate, at a cost of £1,200.

Newry (Co. Down).—U.D.C. has approved a £30,000 scheme for fluorescent street lighting.

Nuneaton.—The T.C. is recommended to submit to M.o.T. a scheme for extension of fluorescent lighting in the town centre and additional sodium lighting elsewhere, at a cost of £10,740.

Oswaldtwistle.—The U.D.C. has approved a scheme for replacing gas lighting with electricity in Union Road, at a cost of £3,808. The M.o.T. is also to be approached regarding a similar proposal for Blackburn Road.

Spenborough.—Ministry consent has been obtained to the borrowing by the Council of £12,000 for the conversion from gas to electricity of street lighting in Leeds and Whitehall (Branch) Road, and on the Leeds and Elland County Road.

Company Activities

Dewhurst & Partner

For the year to September 30 last, the trading profit, investment and other income amounted to £117,309 (*£86,806*). Directors' emoluments absorb £10,437 (*£6,350*), depreciation and amounts written off £4,949 (*£3,177*), taxation £60,000 (*£40,000*), leaving a net profit of £40,764 (*£36,738*). To bonus issue expense £1,097, transferred to capital account re bonus issue £95,059, interim dividend 10% on £60,000 capital takes £3,150 (*£3,300*) and final of 12½% on £180,000 absorbs £11,812 (*£8,250*), leaving £77,816 (*£148,170*) carried forward.

Hoffman Manufacturing Co.

Group trading profit for 1950 was £1,093,179 (*£862,193*). After charging depreciation of £157,803 (*£148,823*), directors' fees £4,400 (*£3,700*), employees' pension funds £39,838 (*£36,001*), taxation of £525,101 (*£360,942*), and other charges, the net profit is £382,297 (*£321,922*), of which the amount relating to Hoffmann Manfg. is £299,169 (*£280,286*). The sum of £10,000 (*same*) is transferred to the benevolent fund, £160,000 (*£155,000*) to fixed asset replacement reserve, and £177,553 (*£174,135*) is carried forward.

Pernambuco Tramways & Power Co.

Holders of the 5% First Debentures of the Pernambuco Tramways and Power Company have received an offer from the American and Foreign Power Company Inc. to purchase £200,000 of the £913,975 Debentures outstanding at 35%, which is around the market price. The American and Foreign Power Company, though a subsidiary, owns practically all the equity of the Pernambuco company and the Witan Investment Company, trustees for the Debenture holders, as substantial holders themselves of the Debentures, say they are disposed to accept the offer and sell 25% of their holding.

Jerusalem Electric & P. S. Corp.

The operating balance for the year ended March 31 last is £(Israeli)108,387 (*£22,622*), after charging administration expenses. Transferred to central amortisation fund £21,243, to plant renewals and depreciation £80,000, and to provident fund £6,500, leaving the sum of £3,876 (*£3,232*) carried forward.

Dividends Declared

London Electrical and General Trust.—Interim of 2½% (*2%*).

Rothermel Corpn. Ltd.—Interim of 10% (*same*) on increased capital.

Commercial Information

CONTRACTS OPEN

HOME

Dec. 14.—Cambridge. Supply only of 406 140 W open-type sodium lanterns. Applications by above date to T. V. Burrows, City Engineer and Surveyor, The Guildhall. Deposit £1 1s.

Dec. 14.—Sheffield. Electrical installation at Eccleshall primary infants school. W. Geo. Davies, City Architect, Town Hall. Deposit £2.

Dec. 15.—Slough T.C. Provision of 50 concrete columns and 42 lanterns with low mercury vapour lighting equipment, and erection of 42 columns and lighting installation along Langley Rd. Borough Engineer, Town Hall. Deposit £1 1s.

Dec. 17. — Ashton-under-Lyne T.C. Electrical installation at fire station. A. T. Kemp, Municipal Offices. Deposit 10s.

Dec. 17.—Darlington. Provision and erection of two electric motor and centrifugal pump sets, automatically controlled. Council's Consulting Engineer, Arnold Brooksbank, 14 The Exchange, Bradford. Dep. £2 2s.

Dec. 17.—Hastings T.C. Electrical installation in 98 dwellings on Blacklands Farm estate, Hollington. Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

Dec. 17.—West Riding. Installation of electricity at Swinton Queen St. School. County Architect, Bishopgarth, Westfield Rd., Wakefield.

Dec. 17.—West Riding. Installation of electricity at West Tadcaster county school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Dec. 18.—Altrincham T.C. Following for street lighting scheme in Stockport Rd.: (a) supply and erection of 32 concrete columns and wiring, 15 conversion brackets to existing steel columns, and installation of 47 lanterns, 250 W h.p. mercury lamps and auxiliary equipment; (b) supply of 47 lanterns, 250 W h.p. mercury lamps and auxiliary equipment; (c) supply and erection of 21 concrete columns and wiring, installation of 21 lanterns, 400 W h.p. mercury lamps and auxiliary equipment; (d) supply of 21 lanterns, 400 W h.p. mercury lamps and auxiliary equipment. Borough Surveyor, Town Hall. Deposit £2 2s.

Dec. 19.—Ealing T.C. Electrical work to lighting system at Ealing grammar school. C. W. Seddon, Borough Engineer and Surveyor, Town Hall, W.5. Deposit £2.

Dec. 19—Fermanagh C.C. Electric heating in Enniskillen Tech. School. Architects at Education Office, 27 High St., Enniskillen.

Dec. 19.—Manchester. Supply of (a) synchronous motor driven electric time switches, and (b) tubular type extension boxes for conversion of street lighting gas-lamp pillars with auxiliary equipment for lanterns, during year beginning Jan. 1, 1952. City Surveyor, Town Hall. These are separate contracts. (Both advertised in Nov. 29 issue.)

Dec. 19.—Swindon T.C. Supply and installation of electric cabling, wiring, fittings and equipment for extensions to Rodbourne sewage works. Borough Surveyor, Civic Offices. Deposit £2. (See Nov. 22 issue.)

Dec. 19. — Wandsworth B.C. Supply and erection of street lighting equipment for various estates. Borough Engineer, Surveyor and Architect, Municipal Buildings, S.W.18.

Dec. 20.—Sunderland T.C. Electrical installation in extensions to technical college. Architects, G. T. Brown and Son, Barclay Chambers, Fawcett St. Deposit £2 2s.

Dec. 22.—Drumquin (Co. Tyrone). Electrical heating and lighting in St. Patrick's church and hall. John O'Kane, secretary, parish committee, Drumquin.

Dec. 29.—Cork T.C. Supply of an 8-in. electric bench grinder and a portable electric bench sanding machine, all motors for 3-phase, 380V 5 c/s a.c. Philip Monahan, City Manager and Town Clerk, City Hall.

Dec. 31.—Cambridge. Electrical work in Queen Edith's Way primary schools. City Engineer and Surveyor, The Guildhall. Deposit £2 2s. (Advertised in this issue.)

Dec. 31.—Dalkeith T.C. Installation of sodium lighting along part of trunk roads A68 and A7. Burgh Surveyor, Municipal Buildings.

Dec. 31.—Manchester. Electrical installation at Moss House school, New Moston. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Dec. 31.—Southgate T.C. Supply of castings (lamp columns, etc.) included in list of requirements during year ending March 31, 1953. J. T. W. Peat, Borough Engineer and Surveyor, Southgate Town Hall, Palmers Green, N.13.

Dec. 31.—Staffordshire. Fire Brigade requires supply of electric handlamps. Chief Fire Officer, Brigade H.Q., Pirehill, Aston, Stone.

Jan. 1.—Stourbridge. Manufacture, supply and erection of electrically operated centrifugal pumping plant, including electric motors, switchgear, wiring, etc. Geo. P. Deeley, 13 Church St. Deposit £5 5s.

Jan. 2.—Leeds. Supply and erection of an electrically driven centrifugal pump. General Manager and Engineer, Waterworks Dept., Civic Hall.

Jan. 2.—Wandsworth B.C. Electric lamps included in list of supplies for year beginning April 1, 1952. R. H. Jerman, Town Clerk, Municipal Buildings, S.W.18.

Jan. 4.—Belfast. Supply and erection of (a) one 7½-ton and one 5-ton overhead travelling crane, one electric lift (2,000lb capacity), workshop machinery and equipment, self-contained transport weighbridge; and (b) lighting, heating and auxiliary power installations; for harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. each item. (See Nov. 22 issue.)

Jan. 4.—Belfast. Supply and erection of complete coal-handling plant for Victoria power station, conveyors, automatic weighers and all ancillary equipment. Merz and McLellan, consulting engineers, Carliol House, Newcastle - on - Tyne. Deposit £5 5s. (See Nov. 8 issue).

Jan. 4.—Belfast. Supply and erection of two complete sets of

condensate chemical treatment plant for turbo alternators at Victoria power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. Also supply of sundry items in list of annual stores including switchgear, time switches, static transformers, street lighting equipment, overhead line materials, cables, cookers, etc. Documents from Electricity Dept., East Bridge St., Belfast. Fee, 10s. (Both are advertised in Dec. 6 issue.)

Jan. 5.—Dagenham T.C. Electric lamps and supplies included in list of requirements for year beginning April 1, 1952. Borough Engineer and Surveyor, Civic Centre.

Jan. 9.—Hepton R.D.C. Supply and installation of 31 lanterns, lamps control gear and steel standards for Group A lighting on trunk road A646 at Charlestown, Yorks; also for supply of 11 lanterns, lamps, control gear and brackets; 140 W sodium lamps to be used. Surveyor to Council, District Bank Chambers, Hepden Bridge. Deposit £2 2s. (Advertised in this issue.)

Jan. 11.—Manchester. Electrical installation in home for aged persons, Nuthurst Rd., Moston. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Jan. 12.—Galway. Supply and installation in pumphouse of two direct-driven horizontal centrifugal pumps and two electric motors with all necessary accessories. C.C.'s consulting engineer, E. R. Ryan, 1 Montpellier Terrace, Galway. Deposit £5 5s.

Jan. 14.—Aireborough U.D.C. Supply and installation of (a) columns and brackets, and fitting and wiring of lanterns, and (b) supply of lanterns and all auxiliary gear; for 250W mercury discharge lighting along 2½ miles of Leeds Rd. Engineer and Surveyor, Council Offices, Micklefield House, Rawdon, nr. Leeds. Deposit £2 2s. (See Nov. 15 issue.)

Jan. 21.—Ealing T.C. Lamp columns included in list of supplies needed for year ending March 31, 1952. Borough Engineer and Surveyor, Town Hall, Ealing W.5.

Jan. 31.—Norwich. Supply and erection of two sets of electrically driven vertical spindle, centrifugal foul sewer pumps and ancillary equipment. City Engineer, City Hall. Deposit £5.

Feb. 1.—Ireland. Supply and erection of hydro-electric generating plant at Inniscarra and Carrigadriod stations on River Lee. Documents from Chief Generation Engineer, Electricity Supply Board, 27 Lower Fitzwilliam St., Dublin, C.18. Deposit £5 5s. (See Nov. 1 issue.)

No date stated.—Bucks. C.C. Equipment for Slough College of Further Education. D. E. Cooke, Chief Education Officer, County Offices, Aylesbury. (See Nov. 29 issue.)

No date stated.—Guildford T.C. Electrical installation in 150 houses, Bushy Hill, Merrow. Borough Engineer and Surveyor, Municipal Offices, High St.

No date stated.—N. of Scotland H.E. Board. Supply and erection of approximately 47 miles of 22 kV, 10 miles of 11 kV, and 30 miles of l.v. single-circuit wood pole overhead transmission and distribution lines in islands of Benbecula, S.Uist and Eriskay. Engineers, Merz and McLellan, 39 Northumberland St., Edinburgh 3. Deposit £1 1s. (See Nov. 22 issue.)

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Jan. 30.—Tangiers. Construction of fluorescent street lighting network in part of Tangiers for Direction de la Regie des Services de l'Eau et de l'Electricite, 4 Rue Vermeer, Tangiers. Deposit 1,500 francs.

Feb. 13.—New South Wales. Dept. of Railways requires supply and installation of cables and associated equipment for supervisory services and communications on electric railway. Agent General for N.S.W., 56 Strand, W.C.2.

Feb. 13.—Queensland. Manufacture and supply of paper-insulated, lead covered single-wire armoured cables and cable boxes for 600 V or 11 kV. State Elect. Commission, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref. CRE (IB) 76903/51).*

Feb. 13.—Queensland. Supply and erection of a 450/500 kW gas-cum-oil engine generating set for Charleville T.C. State Electricity Commission, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref. CRE (IB) 76905/51).*

Feb. 14.—S. Rhodesia. Manufacture and supply of 88 kV transformers with auxiliary equipment, for Elect. Supply Commission, P.O. Box 377, Salisbury. B.o.T. (Ref. CRE (IB) 76915/51)*.

Feb. 20.—South Africa. Supply of street lighting equipment for illumination of Foreshore Extension of Cape Town, comprising some 210 mercury vapour units and 150 fluorescent units. All lamps for operation on 220/240 V 50 c/s a.c. supply. Electricity House, Strand St. B.o.T.(Ref.CRE (IB) 76856/51)*.

Your Queries — Answered

"A.C.S." thermostats, makers of? C.W.—Should this device be marked 1527112 it is an adaptation of a product of the A. C. Sphinx Sparking Plug Co., a subsidiary of General Motors Ltd., 23 Buckingham Gate, London S.W.1. (22146)

Coffee grinders—small commercial or domestic, makers of? J.R.—The smallest appliance that we have traced has a capacity of ½ lb. per minute, this is produced by Uno Co. Ltd., 90 Minories, London E.C.3. (22153)

Door locks, electrically operated, makers of? E.H.—W. C. Davey and Co., 180 Tottenham Court Rd., W.1, Cox-Walkers Ltd., Darlington. (22161)

"Renat" lighting fittings, makers of? B.C.—New Endeavour Eng. Ltd., 4a Avenue Rd., Harlesden, N.W.10. (22168)

"National" washing machines, makers of? J.J.—National Utilities Ltd., 8 South King St., Manchester 2. (22175)

"Lyndon" conduit dies, makers of? T.B.—Tom Carrington and Co. Ltd., Lyndon Tool Works, Stony Lane, West Bromwich. (22183)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Feb. 22.—Brisbane. Supply of thirty-six 300 kVA and thirty-six 200 kVA three phase 10,500 V Delta to 430/248 V Star, no load, step down, outdoor distribution transformers with oil and h.t. cable boxes. City Hall, Brisbane. B.o.T. (Ref. CRE (IB) 76904/51)*.

Feb. 29.—Johannesburg. Electricity Dept. invites tenders for supply and erection of (a) six stoker-fired water tube boiler units; (b) three 30,000 kW C.M.R. turbo-alternators with auxiliary apparatus; (c) three sets of condensing plant for above; (d) one 180,000 lb. overhead electric travelling crane, one 43,000 lb. crane and one 27,000 lb crane. Separate contracts. Documents from the Dept. at Room 19, Head Offices, President Street West, Johannesburg. Deposit £5 5s.

CONTRACTS PLACED

Aberdeen T.C. Supply of electrical fittings, installation and allied works in connection with erection of new Raden area schools, J. L. T. Parkinson Ltd., £14,489.

Eastbourne T.C. Rewiring of town hall, H. Beney and Sons, £1,054.

Hetton (Durham) U.D.C. Electrical work in 130 houses at Broomhill, £4,365, and 125 houses in Easington Lane, £2,880. N.E. Electricity Board.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Ann-D. B701,082. Class 11. Safety guards being fittings for electric fires. Kleerun Trap Co. Ltd., Lane End, High Wycombe.

Linoglas. 700,178. Class 9. Illuminated glass signs. Linolite Ltd., The Mill Works, Malmesbury, Wilts.

Oldham. 697.390. Class 11. Miners' lamps. Oldham and Son Ltd., 36 Hyde Rd., Denton, nr. Manchester.

Stanrun. 702,430. Class 7. Electrically operated overhead chain conveyors. Geo W. King Ltd., Harford Works, Walsworth Rd., Hitchin, Herts.

Unitone Products. B700,198. Class 9. Electrical sound amplifiers for use with musical instruments. Jennings Musical Instruments Ltd., 119, Dartford Rd., Dartford, Kent.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	175 0 0	152 0 0
" "English" quality ...	176 10 0	
Tin (99·99·75%) ... ...(Cash)	940-945	—
" (3 months)	927½-930	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	156 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	55 5 0	—
Mild Steel Tape (0·04 in.)	32 5 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

O. P. Docherty and Co. Ltd. Meeting of members will be held at 4 Frederick St., Sunderland, on Jan. 21 at 12 noon to receive liquidator's report.

Elexcel Ltd. Creditors are asked to send particulars to liquidators, Wilfrid Palmer Scowcroft and George Davidson Christie, c/o Hill, Dickinson and Co., 10 Water St., Liverpool 2, by Feb. 1. (Official announcement appears on page 57.)

T. and H. Electrical Service Ltd. Resolution for voluntary winding-up passed at meeting on Nov. 20. At a subsequent meeting of creditors N. W. Osborne, Chartered Accountant, 11-12 Finsbury Sq., London, E.C.2, was appointed liquidator.

S.W. and S. Development Co. Ltd. Resolution for voluntary winding-up was passed at meeting on Nov. 23. Liquidator appointed is Alfred Bridge Hodson, Mucklow Hill, Halesowen, nr Birmingham.

Hart Accumulator Co. Ltd. and **National Accumulator Co. Ltd.** Resolutions passed at meetings on Nov. 30 for voluntary winding-up of both companies. Harold Ganstoun Gill, C.A., 10 Norfolk St., Manchester 2, was appointed liquidator in both cases.

First Meeting

London. Electrical and Radio Installations (Ealing) Ltd. Meetings of creditors and contributories, today (Thursday) at Inveresk House, Strand, W.C.2, at 11.30 a.m. and 12 noon resp.

Appointment of Liquidator

London. U. V. Beams Ltd. Norman W. Osborne, 11-12 Finsbury Sq., E.C.2, has been appointed liquidator with committee of inspection.

BANKRUPTCY ACTS

Intended Dividends

Liverpool. Frank Taylor, electrical contractor, trading at 4 Mercer Court, and 46 Fenwick St., Liverpool. Last day for receiving proofs, Dec. 18. Trustee is Parkin S. Booth, 5 Rumford Place, Liverpool 3.

Windsor. Edward Wm. Thorne, plumbing and electrical engineer, trading at 123 King St., Maidenhead. Last day for receiving proofs, Dec. 22. Trustee is Richard Langdon Davis, C.A., Bedford Row House, 58 Theobalds Rd., London, W.C.1.

Public Examinations

Truro. William D. Newell, radio and electrical engineer, trading at 35 Duke St., Padstow. First meeting was on Tuesday and public examination at Town Hall, Truro, on Jan. 3, 12 noon.

TRADE NOTES

Changes of Address. As from December 17 the address of Ewbank and Partners Ltd. will be 10/11 Grosvenor Place, S.W.1. Telephone 0486-90 and 0731-5.

The London offices and stores of S. O. Bowker Ltd. are now at 24/36 Oxford Street, W.1. The telephone number remains as Museum 4695.

E. K. Cole Ltd., now expect to move into their new London headquarters at 45, Essex Street, Strand, W.C.2, on Jan. 1 next.

Beama Contract Price Adjustment Formulae. For purposes of calculating variations in (a) "Rates of Pay"—the rate of pay for adult male labour at November 23, 1951, shall be deemed to be 134s.;(b) "Cost of Material"; the index figure for Intermediate Products last published by the Board of Trade on December 8 is 375.4 and is the figure for the month of November, 1951.

BUSINESS PROSPECTS

HOME

Argyll. It is proposed to build 54 houses on a number of sites.

Armagh. Approval received for erection of schools at Portadown and Newtownhamilton.

Bridlington T.C. Eighty houses to be built on West Hill estate next year.

Brighton T.C. Erection of 141 houses on Hollingdean estate. Borough Engineer and Surveyor, 26-30 King's Road.

Bucks. Erection of school at Langley. County Architect, County Hall, Aylesbury.

Cardiff. Construction of Cae'r Castell secondary school at Rumney. City Surveyor, City Hall.

Cumberland. A library is to be built at Maryport. County Architect is J. H. Haughan, Portland Sq., Carlisle.

Dagenham. Consent has been granted to Tuck and Co. Ltd. for factory extensions on Hainault industrial estate.

Dunmow (Essex) R.D.C. 28 houses to be built on four sites.

East Barnet U.D.C. is seeking permission to erect 100 maisonettes for old people in Church Hill Rd. at estimated cost of £25,000.

Erith (Kent) T.C. Erection of 40 flats in 6 blocks, and 3 other dwellings at Abbey Wood. John H. Clayton, Borough Engineer and Surveyor, Town Hall.

Hartlepool. J. B. Pillin Ltd. are to extend their factory on Hartlepools trading estate.

Harwich T.C. Erection of 124 dwellings on Pound Farm site, Dovercourt. Documents from Borough Architect's Dept.

Hastings T.C. Preliminary details of a large-scale factory project were disclosed recently. Further information to be released later. It will cover an 8-acre site and employ about 240 people.

Hawick. Dean of Guild Court has approved extension of a factory at Mansfield for Turner, Rutherford and Co.

Haydock (Lancs) U.D.C. Construction of 32 houses on Church Rd. site. Surveyor is R. Main, Council Offices.

Helston T.C. It is proposed to build 41 houses in Clodgey Lane for Admiralty.

Horbury U.D.C. Erection of 20 houses on Manor Fields site. Engineer and Surveyor, Town Hall.

Hull. It is proposed to build a telephone exchange at Ferriby.

Ilford T.C. recommended to approve plans for factory extensions in Grove Rd. for J. Clark (Brush Materials) Ltd. Architects are Evans, Crowe and Partners, 5 High St., Romford.

Ilkley U.D.C. Erection of 12 houses and 8 old persons' dwellings at Burley. A. Skinner, Surveyor, Chantry Drive.

Littlehampton U.D.C. Ministry of Agriculture and Fisheries intend to buy land for establishment of agricultural research station.

Liverpool. Scheme for T.A. headquarters, prepared by Gilbert Fraser, architect, 27 Dale St. Council has also been recommended to apply for sanction to borrow several thousands of pounds for erection of sundry colleges and schools. Also, J. H. Peck Ltd. propose to build a factory in Oriel St. W. Lewis, architect, 32 Castle St.

Longford. Plans prepared for erection of hospital at Glebe. Cost is estimated at £175,000.

Louth T.C. Erection of 32 houses on Eastfield Rd. estate. Town Clerk, Town Hall.

Middlesbrough. Erection of Green Lane primary school. Education Architect is P. R. Middleton, Education Offices, Woodlands Rd.

Middlesex. Plans in hand for construction of schools at Northwood Hills; Dormers Wells Lane, Southall; Waterfall Rd., Southgate Green; and at Tottenham.

Montgomery. Extensions and alterations to primary school. T. G. Davies, director of educ., County Offices, Newtown.

Northants. Permission being sought to borrow £47,532 for 32 houses on four sites by Northampton rural council.

N. Ireland. Construction of local office for Ministry of Labour and National Insurance at Limavady. Co, Londonderry. Documents from Ministry of Finance (Room 103), Law Courts Building, May St., Belfast.

Northfleet U.D.C. Erection of 32 houses on Coldharbour Rd. estate. Council Offices, Northfleet, Kent.

Norton-Radstock (Som.) R.D.C. Plans in hand for 40 houses and 8 bungalows at Northfield and 161 houses at Westfield.

Norwich. Construction of 44 dwellings in Woodcock Rd. City Architect, City Hall.

Offaly (Eire). Erection of vocational school at Banagher. J. O'Brien, quantity surveyor, 8 Leinster St., Dublin.

Perth and Kinross. Two nursery schools and a primary school are to be built in Letham area.

Rickmansworth U.D.C. Erection of 142 houses on Berry Lane estate. Engineer and Surveyor, Council Offices.

Rochford (Essex) R.D.C. Erection of a total of 54 houses on 5 sites. S. C. Harris, Clerk, Council Offices.

Sleaford U.D.C. Erection of 26 houses on Galley Hill estate. F. J. Lenton and Partners, 16 Finkin St., Grantham, Lincs.

South Shields. Plans approved for four-storey premises in Market Place for Allen and Co. (South Shields) Ltd. Architects are S. W. Milburn and Partners, 9 Esplanade, Sunderland. Work to begin shortly.

Stirling. C.C. proposes to build 140 houses at Logie.

Stroud U.D.C. Construction of 34 houses in three sections. F. Foster Langley, Engineer and Surveyor, Council Chambers, High St.

Sunderland T.C. Next year's estimates include a £55,000 health centre, £4,000 occupational centre for T.B. patients and a £22,000 plan for mental health occupational centre. Borough Architect is H. C. Bishop, Grange House, Stockton Road.

Widnes T.C. Construction of stage 1 of College for further education and Ditchfield Rd. county school. Borough Architect, Brendon Hse., Widnes Rd.

Worthing T.C. Erection of Maybridge junior and infants' school. Borough Engineer and Surveyor, Town Hall.

OVERSEAS

Canada. J. H. Connor and Son Ltd., 207 Montcalm St., Hull, Quebec, would like to receive proposals from U.K. manufacturers of domestic appliances who wish to arrange for assembly and sale of their products in the Dominion.

India. Southfield and Co., 50 Thambuchetty St., Madras 1, want to contact suppliers and manufacturers of electrical equipment and machinery.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Alsheath Ltd., Norfolk House, Norfolk St., W.C.2. To enter into an agreement dated Oct. 25, 1951, and made between the Loewy Engineering Co. Ltd., and British Insulated Callender's Cables Ltd., and to establish and maintain research laboratories and experimental workshops, etc. Cap.: £1,000. First chairman: J. L. Harvey. Dirs.: Not named. Subs.: G. C. Brown and A. F. Johnson (solicitors), 18 Austin Friars, E.C.2.

B. K. Partners Ltd., 17 Station Rd., Aldershot, Hants. Electrical, mechanical, general and radio engineers, etc. Cap.: £1,000. Dirs.: I. D. Stuart and A. E. Benney.

Butaworth Products Ltd., Brickcast Yard, Between St., Cobham, Surrey. Manufacturers of and dealers in domestic, household, electrical and fancy goods, etc. Cap.: £100. Dirs.: A. S. Worthington and Gertrude A. Worthington.

Midland Wireless (Bedford) Ltd. To take over business carried on by the Midland Wireless and Electrical Appliance Co., Ltd., at 76 Midland Rd., Bedford, and 112 Leavesden Rd., Watford. Cap.: £10,000. Dirs.: J. E. M. Johns and E. J. Walker.

Television Mainstal (London) Ltd. Electricians, radio and television engineers etc. Cap.: £100. Dirs.: to be appointed by the subs. Subs.: R. R. Bell, 52 Talbot Rd., Isleworth, Middx., and Winifred C. Thwaites, 291, Kingston Rd., Ashford, Middx.

Uncles Bliss (Export) Ltd., 139 Cherry Orchard Rd., Croydon, Surrey. Mnfrs. of and dealers in electrical goods, wireless, television sets, etc. Cap.: £1,000. Dirs.: J. Bliss and Faye Bliss.

Vernon Ashworth Ltd., 592, Old Chester Rd., Rock Ferry, Ches. To take over business of an electrical, radio and television engineer carried on at present by Vernon Ashworth, etc. Cap.: £3,000. Dirs.: V. Ashworth, and H. G. Swindells.

Wynall Transformers Ltd. Electrical and motor engineers, etc. Cap.: £1,000. Dirs.: A. C. Withnell, 2 Friars Lane, Richmond, Surrey, and J. A. Hall.

MEETINGS TO NOTE

THURSDAY, DEC. 13

I.E.S. (Glasgow Centre). — "Church Lighting." L. C. Retting. 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Leicester Centre).—"What I Have Learned About Lighting from the Festival." T. O. Freeth. Elect. Showroom, Charles St., 6.30 p.m.

I.E.S. (Manchester Centre).—"Brightness Engineering." W. Robinson. Town Hall Extension, 6 p.m.

INSTN. OF WORKS MANAGERS (Wembley sub-branch).—"Maintenance and the Works Manager." C. J. Peppiatts of G.E.C. Lamp Works. The Plough, Kenton Rd., Kenton, 12.30 p.m.

E.P.E.A. (Merseyside Tech. Group).—"Modern Turbines for use on High Steam Pressure and Temperature." Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

WORCESTER ELECTRIC CLUB.—"Modern Resistance Welding Machines." A. G. Galle. Talbot Hotel, Tything, 7.15 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London Graduates).—"Heating and Ventilating Schools." A. F. Myers and J. C. Weston. 39 Victoria St., S.W.1, 6 p.m.

BRITISH INSTN. OF RADIO ENGRS. (London).—"Electronic Analogues of Physiological Processes." W. Grey Walters and H. W. Shipton. School of Hygiene, Keppel St., W.C.1, 6.30 p.m.

I.E.E. (N. Midland Centre).—"Design of Power Transformers to withstand Surges due to Lightning." A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Strom. Y.E.B., Ferensway, Hull, 7.30 p.m.

I.E.E. (N.E. Scotland sub-centre). —"Survey of Modern Methods of Presentation of Instrument Readings and Recordings." L. B. S. Golds. Royal Hotel, Dundee, 7 p.m.

I.E.E. (London Utilisation Section).—"Characteristics and Control of Rectifier-Motor Variable-speed Drives." P. Bingley. Savoy Place, W.C.2, 5.30 p.m.

FRIDAY, DEC. 14

A.S.E.E. (Bristol Branch). — "Lighting—Theory and Practice." R. S. Hazell. Grand Hotel, 7.30 p.m.

A.S.E.E. (Crewe Branch).—"Television." R. V. Peters. Copeland Arms Hotel, Stoke, 7.30 p.m.

I.E.S. (Cardiff Centre).—Annual dinner and dance.

MONDAY, DEC. 17

INSTN. OF WORKS MANAGERS (Glasgow Branch).—"Electronics." Speaker from Ferranti Ltd. 39 Elmbank Crescent, 7.15 p.m.

I.E.E. (N.E. Radio and Measurements Group).—"Electrical Instrument Design." G. E. Moore. King's College, Newcastle, 6.15 p.m.

I.E.E. (London Radio Section).—"What Practical Benefits can Communication Engineers expect from the Modern Information Theory?" E. C. Cherry. Savoy Place, W.C.2, 5.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—"Modern Oil Engine." R. W. S. Mitchell. University, Edmund St., 6.15 p.m.

A.S.E.E. (Bournemouth Branch). —"Electric Resistance Heating." T. F. Stanley. Grand Hotel, 8.15 p.m.

TUESDAY, DEC. 18

DUMFRIES AND GALLOWAY ELECT. SOC.—"Faults in Fluorescent Lamps and their Circuits." J. F. Roper. Ewart Library, Dumfries, 7.30 p.m.

A.S.E.E. (London).—"Engineer in the Welfare State." R. F. Mathieson. L.S.B., 2 Savoy Hill, W.C.2, 6.30 p.m.

INCORP. PLANT ENGRS. (Glasgow). —"Safety in Use of Portable Electric Tools." J. L. Wood. Engineering Centre, Sauchiehall St., 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (W. Midlands section).—"Design and Application of Industrial H.F. Heaters." F. W. Budge. Wolverhampton Technical College, 7 p.m.

I.E.E. (N.W. Measurements Group).—"Special Characteristics of Soft Magnetic Materials in Instrument Manufacture." G. A. V. Sowter. Engrs.' Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (S. Midland Centre).—Faraday lecture on "Sound Recording—Home, Professional, Industrial and Scientific Applications." G. F. Dutton. Town Hall, Birmingham, 6 p.m.

WEDNESDAY, DEC. 19

I.E.S. (Tees-side Group).—"Street Lighting." A. J. Ogle. Cleveland Scientific and Tech. Inst., Corporation Rd., Middlesbrough, 6.30 p.m.

I.E.E. (E. Midland Centre). Faraday Lecture on "Sound Recording." G. F. Dutton. De Montford Hall, Leicester, 7.15 p.m.

I.E.E. (Southern Centre). "Electricity in Chemical Works." W. A. Gallon. Technical College, Brighton, 6.30 p.m.

I.E.E. (London Supply Section).—"Inhibited Transformer Oil." W. R. Stoker and C. N. Thompson. "Stability of Oil in Transformers," P. W. L. Gossling and L. H. Welch.

A.S.E.E. (Manchester Branch).—"Chairman's Night." Engineers' Club, Albert Sq., 7.30 p.m.

THURSDAY, DEC. 20

I.E.S. (Glos. and Cheltenham Centre).—"Light as an aid to Crime Detection." C. H. Edlin. Cadena Cafe, High St., Cheltenham, 6.15 p.m

I.E.E. (Irish Branch).—"Electricity Tariffs and Rationing." Opened by Lt.-Col. Edgeworth. Trinity College, Dublin, 6 p.m.

A.S.E.E. (Luton Branch). "Maintenance of Factory Equipment." A. Carpenter. George Hotel, 8 p.m.

FRIDAY, DEC. 28

JNR. INSTN. OF ENGINEERS—"Hydro-Electric Power Developments." J. Foster Petree. 39 Victoria St., S.W.1, 6.30 p.m.

HENLEY *Modern*

DISTRIBUTION PILLARS AND PANELS

GROUP 24

Designed by engineers of experience

Embodied in the new HENLEY Distribution Pillars are all those features that keen distribution engineers are looking for, together with a shell of modern pleasing appearance.

Robust cast-iron construction throughout with detachable plinth and roof.

Adequate provision for ventilation.

One-piece insulating right-angle type shields acting as phase barriers and vertical front shields for busbars.

Four sizes of Units are available, 200 to 1,000 amp, suitable for 3-phase 4-wire systems with cartridge fuse-link protection up to 60 amp for fifth core, if required. Units for other systems can be supplied.

One-piece insulators with specially designed entry to facilitate insertion or removal of conductor fittings.

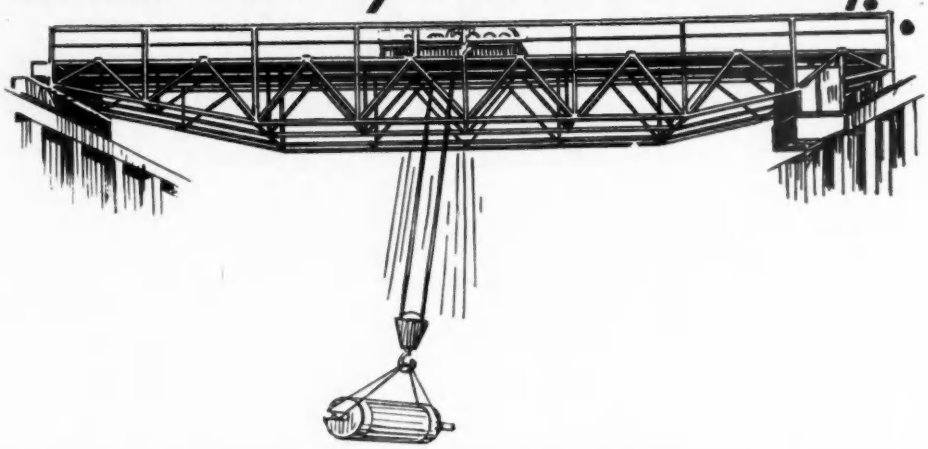
Conductor fittings are reversible and interchangeable. Crossing of conductor cores is avoided.

Height 3′ 11″ above ground. Depth 14½″.

Please ask for Catalogue 24.

W.T.HENLEY'S TELEGRAPH WORKS CO. LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

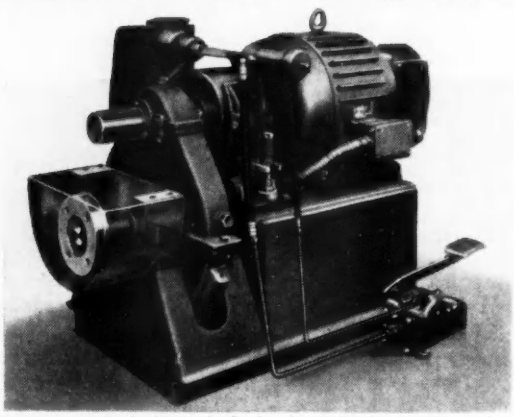
Avoid this by smooth braking!



with the NEW ELECTRO-HYDRAULIC PERIGRIP BRAKE

This photograph of a demonstration unit shows an electro-hydraulic brake with foot pedal for transmitting the working pressure to the receiver unit of the brake which gives a torque proportionate to the pedal pressure.*

**Supplied by Messrs. Exactor Ltd.*



This new electro-hydraulic brake has been developed to provide a smooth, quick, braking action on the long travel motions of overhead cranes. It is operated by bringing the controller to the "Off" position and then using the hydraulic foot pedal control, thus eliminating the load swing caused by fierce braking.

D.C. 8″ 10″ 12″ 16″ and 20″ brake drums

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER, 17.
Member of the A.E.I. group of companies

METROVICK *can solve your braking problems*

J/H101

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

PUBLIC NOTICES

IN the matter of ELEXCEL LIMITED, in voluntary liquidation, members' winding up, and in the matter of the Companies Act, 1948.

NOTICE IS HEREBY GIVEN that the creditors of the above-named company, which is being wound up voluntarily, are required on or before the 1st day of February, 1952, to send in their names and addresses and the particulars of their debts or claims and the names and addresses of their solicitors (if any) to the undersigned, the solicitors for Wilfrid Palmer Scowcroft and George Davidson Christie, the liquidators of the said company, and if so required by notice in writing by the said liquidators are by their solicitors or personally to come in and prove the said debts or claims at such time and place as shall be specified in such notice or in default thereof they will be excluded from the benefit of any distribution made before such debts are proved.

Dated this 4th day of December, 1951.

HILL, DICKINSON AND CO.
Solicitors for the above-named Liquidators.

10 Water Street,
Liverpool 2. (P 371)

TENDERS INVITED

CITY OF MANCHESTER

THE WELFARE SERVICES COMMITTEE invite tenders for the ELECTRICAL INSTALLATION in Home For Aged Persons, Nuthurst Road, Moston, Manchester.

Specification may be obtained and drawing seen at the office of the City Architect, Town Hall, upon payment of £1 1s. 0d., which sum will be returned upon receipt of bona fide tender. All cheques and postal orders are to be made payable to the order of "The Corporation of Manchester" and crossed.

Sealed tenders, enclosed in the official envelope, to be delivered at the Town Hall, not later than 10 a.m., on Friday, January 11, 1952.

The Corporation do not bind themselves to accept the lowest or any tender.

PHILIP B. DINGLE,
Town Clerk.

Town Hall, Manchester 2.
December, 1951. (P 372)

HEPTON RURAL DISTRICT COUNCIL

STREET LIGHTING

TENDERS are invited for the supply and installation of 31 No. Lanterns, Lamps, Control Gear and Steel Standards for Group "A" Lighting on the Leeds-Halifax-Preston Trunk Road A646 at Charlestown, Hebden Bridge, Yorks, in the Rural District of Hepton.

Tenders are also invited for the supply of 11 No. Lanterns, Lamps, Control Gear and Brackets.

140-watt Sodium Discharge Lamps in enclosed-type lanterns are specified with a mounting height of 25 ft.

Drawings and conditions of contract may be inspected at the office of the surveyor to the council at District Bank Chambers, Hebden Bridge, from whom copies of the specification and form of tender may be obtained, on payment of a deposit of £2 2s. which will be refunded on receipt of a bona fide tender.

Tenders in plain sealed envelopes, endorsed "Sodium Lighting," should reach the undersigned not later than noon on Wednesday, January 9, 1952.

No undertaking is given to accept the lowest or any tender.

E. H. BLACKBURN,
Clerk to the Council.

District Bank Chambers, Hebden Bridge.
December 14, 1951. (P 414)

CITY OF MANCHESTER

THE EDUCATION COMMITTEE invite tenders for the electrical installation at Moss House County Secondary School, New Moston, Manchester.

Specification and drawings may be obtained at the office of the City Architect, Town Hall, upon payment of £1 1s., which sum will be returned upon receipt of bona-fide tender. All cheques and postal orders are to be made payable to the order of "The Corporation of Manchester" and crossed.

Sealed tenders, enclosed in the official envelope, to be delivered to the Education Offices, Deansgate, Manchester, not later than 10 a.m. on Monday, December 31, 1951.

The Corporation do not bind themselves to accept the lowest or any tender.

PHILIP B. DINGLE,
Town Clerk.

Town Hall, Manchester.
December, 1951. (P 413)

CITY OF CAMBRIDGE

Queen Edith's Way Primary Schools

ELECTRICAL INSTALLATIONS

TENDERS are invited for the electrical installation. Applications for the form of tender, specification, drawings and general conditions should be made to the City Engineer and Surveyor, The Guildhall, Cambridge, before December 31, 1951, after which contractors will be informed when the tender is to be returned.

Applications must be accompanied by a deposit of two guineas, which will be returnable on receipt of a bona fide tender.

The lowest or any tender will not necessarily be accepted.

ALAN H. I. SWIFT,
Town Clerk.

The Guildhall, Cambridge.
December 7, 1951. (P 416)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

GENERAL ASSISTANT ENGINEERS
(TECHNICAL DEPARTMENT)

APPLICATIONS are invited for appointments as General Assistant Engineers in the following sections of the Technical Department:—

(a) Development Section.

Applicants should possess a university degree or equivalent and be capable of carrying out calculations involved in studies on interconnected power systems and preliminary investigation of schemes for system development.

(b) Protection Section.

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in commissioning or maintenance of protective gear. Works experience will be an advantage.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule "C," Grade 8, £481 to £674 p.a.

The appointment will be subject to the provisions of the Authority's Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement. Envelopes to be endorsed "General Assistant Engineers (Technical Department)."

G. A. VOWLES,
Divisional Controller.
(P 417)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified persons for the following positions:—

242/51—POWER STATION SUPERINTENDENT, Derby.

Candidates for this position should have had considerable experience in the operation and management of a modern Generating Station and should also have had experience of pulverised fuel firing.

The salary will be in accordance with the N.J.B. Agreement, Class "F," Grade "I," Schedule "A."

243/51—ASSISTANT MECHANICAL MAINTENANCE ENGINEER, Staythorpe, nr. Newark.

Candidates should have had a thorough mechanical training and possess considerable experience in the maintenance of all types of Boiler House and Turbine Room equipment found in large Generating Stations. The possession of a recognised technical qualification is desirable.

The salary will be in accordance with Class "J," Grade 8 of Schedule "A" of the N.J.B. Agreement.

244/51—JUNIOR ENGINEERS, Staythorpe

Junior Engineers are required at Staythorpe, where suitable young engineers will be given the opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 900°/900 lbs sq in. steam conditions.

The initial salary will be £393 per annum, in accordance with the N.J.B. Agreement, Class "J," Grade 17, Schedule "A."

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or similar qualification.

245/51—THIRD ASSISTANT ENGINEER (Electrical)

Applicants should have had experience in switchgear, electrical auxiliaries, main and multicore cablework, lighting and heating of large power stations, and should possess a Degree or equivalent in Electrical Engineering.

246/51—THIRD ASSISTANT ENGINEER (Mechanical)

Applicants should be thoroughly conversant with all types of plant associated with large Generating Stations, and should be Graduate Members of the Institute of Mechanical Engineers or possess a Degree in Mechanical Engineering or the Higher National Certificate for Mechanical Engineering.

247/51—THIRD ASSISTANT ENGINEER (Civil)

Applicants should hold a Degree in Civil Engineering or be Corporate Members of the Institute of Civil Engineers, and must have had experience in design of heavy foundations, river works, structures in concrete and steel, and other civil engineering works associated with the design of Generating Stations. A knowledge of estimating would be an advantage.

The salaries for Third Assistant Engineers' posts will be within Schedule "C," Class "AX/DX," Grade 5 (£629 to £834 per annum) of the N.J.B. Agreement.

248/51—DRAUGHTSMEN, Transmission Department, Divisional Headquarters

Candidates for this position should have had experience in the design and construction of high-voltage substation or overhead transmission lines.

249/51—ELECTRICAL DRAUGHTSMEN, Transmission Dept., Divisional Headquarters

Candidates should have had general experience on wiring diagrams for large power transformers or high-voltage switchgear, and associated equipment.

The salaries for the posts as Draughtsmen will be in accordance with Grade 5 (£547 to £651 p.a.), or Grade 6 (£413 to £547 p.a.) of Schedule "D," of the N.J.B. Agreement, according to qualifications and experience.

All the above positions will be superannuable within the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, stating vacancy number, and should be returned to him not later than December 28, 1951.

L. F. JEFFREY,
Divisional Controller.

November 29, 1951. (P 344)

ONTARIO, CANADA

A LARGE organisation urgently requires 10 SWITCHGEAR DRAUGHTSMEN, 10 MOTOR GENERATOR DRAUGHTSMEN, 4 INDUSTRIAL CONTROL DRAUGHTSMEN and 1 INDUSTRIAL MOTOR DRAUGHTSMAN. Applicants must be prepared to emigrate to Ontario, have served full apprenticeship with minimum three years experience. Age limit 45. Cost of transportation advanced if necessary.—Write for application forms:

Department "C,"
ONTARIO IMMIGRATION DEPARTMENT
12 New Burlington Street, London W.1. (P 369)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Board's No. 1 Sub-Area:

1. DISTRICT ENGINEER, Liverpool North District.

Salary N.J.B., Grade 3, Class "G" (£946 to £989 p.a.).

Applicants should be Chartered Electrical Engineers and have experience in the construction, operation and maintenance of substations and large networks, both underground and overhead, for voltages up to and including 33 kV.

2. SECOND ASSISTANT ENGINEER (Planning and Operation), at Sub-Area Headquarters, Liverpool.

Salary N.J.B., Grade 7, Class "L" (£901 to £942 p.a.).

Applicants should be suitably qualified and have experience of the design, construction and operation of distribution systems and knowledge of the technical and economic factors in system lay-out and design.

3. SECOND ASSISTANT ENGINEER (Construction), at Sub-Area Headquarters, Liverpool.

Salary N.J.B., Grade 7, Class "L" (£901 to £942 p.a.).

Applicants should be suitably qualified and have experience in the erection of substation plant for voltages up to and including 33 kV.

These appointments will be superannuable and subject to medical examination.

Applications on forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool, should be submitted not later than January 5, 1952.

JAMES RANKIN,
Secretary.
(P 402)

EASTERN ELECTRICITY BOARD

Fens Sub-Area

SERVICE CENTRE ASSISTANT (FEMALE)
Cambridge District

APPLICATIONS are invited from young ladies of good education and pleasant personality for the position of Service Centre Assistant at Cambridge. Experience in the utilisation of electrical appliances and an ability to sell will be an advantage.

The salary for the appointment will be in accordance with the General Clerical grade of the National Joint Salary Agreement, i.e., £120 per annum at age 16 to £284 per annum at age 26, subject thereafter to experience and satisfactory service, up to £344 per annum.

Future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, stating age, education and experience (if any), with details of present appointment and salary, should be submitted to the Manager, Cambridge District, Eastern Electricity Board, 4 Market Hill, Cambridge, within seven days of the appearance of this advertisement.
(P 395)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, GENERAL ASSISTANT ENGINEER (Substations) in the West Central Sub-Area of the Board, based on Fforestfach, Swansea. Applicants should have had a sound engineering training and be suitably qualified. Experience in the construction, commissioning and maintenance of all classes of substations is required.

Preference will be given to applicants who possess the Higher National Certificate in Electrical Engineering, or its equivalent.

Salary for the position will be in accordance with Class "K," Grade 13 (£563/£574/£585) N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary to arrive by December 22, 1951.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (P 398)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Southern Sub-Area

APPLICATIONS are invited for the superannuable post of DISTRICT ENGINEER (Galashiels District). N.J.B. Grade 3, Class "C" (£765-£773-£780).

Applicants must have had a sound engineering training and considerable experience in the construction, operation and maintenance of underground and overhead rural and urban distribution systems, preferably up to 33 kV, and must be thoroughly familiar with district organisation. Technical qualifications of at least Higher National Certificate standard must be held.

Applications, stating age, whether married or single, education, qualifications, experience, and particulars of present post, should reach the undersigned not later than fourteen days from the appearance of this advertisement.

G. H. SANKEY,
Sub-Area Manager.

High Street, Galashiels. (P 389)

METROPOLITAN WATER BOARD

APPOINTMENT OF ASSISTANT ELECTRICAL ENGINEERS

ASSISTANT Engineers (Electrical) required on permanent pensionable staff. Salary scale £655 to £810 per annum. Commencing salary according to age, qualifications and experience. Maximum age 45 years. It is a condition of the appointment to and the continued holding of these positions that the selected candidates shall be, and continue to be, subscribing members of the Institution of Electrical Engineers.

Applicants must have had responsible experience in the layout, specification, design and installation of electrical plant applicable to the pumping of water, including high tension sub-station design and installation, a.c. and d.c. motors and control gear, automatic systems, general lighting and telephones. The persons appointed will be required to advise on the economic purchase and operation of electrical plant.

Modern house available in good neighbourhood if required at inclusive rent of £125 per annum.

Particulars and a form of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope, quoting reference (D).

W. S. CHEVALIER,
Clerk of the Board.

Offices of the Board,
New River Head,
Rosebery Avenue, London E.C.1. (P 375)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Clyde Sub-Area

APPOINTMENT OF DISTRICT ENGINEER
Johnstone District

APPLICATIONS are invited for the appointment of District Engineer in the Johnstone District. Candidates should have had a sound training in electrical engineering and considerable experience in the operation and maintenance of high- and low-voltage networks (overhead and underground) and substations, the supervision of constructional work and the keeping of essential records of mains and substation equipment and layouts.

The salary will be in accordance with the National Joint Board Schedule, Grade 2, Class "F," £977 to £1,020 per annum.

Candidates should preferably be corporate members of the Institution of Electrical Engineers or have equivalent qualifications. The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, education, qualifications and experience, present position and salary, should be received by the Manager, 206 St. Vincent Street, Glasgow C.2, within fourteen days of the appearance of this advertisement.

DANIEL ROSS,
Manager.

December 4, 1951. (P 400)

MIDLANDS ELECTRICITY BOARD

Birmingham and District Sub-Area

APPOINTMENT OF DISTRICT DRAUGHTSMAN

APPLICATIONS are invited for the position of District Draughtsman in the North-Eastern District of the above Sub-Area.

The successful applicant will be required to take charge of the district drawing office and must be fully conversant with up-to-date methods of compiling accurate records of distribution and substation plant alterations and extensions, and able to prepare other drawings associated with this class of work.

The salary and conditions of service will be in accordance with the National Joint Council, Grade 3, £500-£560.

Applications, giving age and particulars of qualifications and experience, should be submitted within seven days of the publication of this notice, in a sealed envelope endorsed "District Draughtsman," and directed to the undersigned: Emil Braathen, Manager, Birmingham and District Sub-Area, Midlands Electricity Board, 14 Dale End, Birmingham 4.

A. STEPHENS,
Secretary.

November 30, 1951. (P 378)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, West Kent District. Salary of £629 to £660 p.a. plus London Weighting, under N.J.B. Schedule, Class "E," Grade 7. Superannuation will be arranged. Applicants should be qualified and preferably Corporate Members of the I.E.E., with experience in all distribution work dealing with single and three-phase systems up to 33 kV and indoor and outdoor type substations, also in estimating for system extensions and reinforcements. Knowledge of rural electrification desirable. Duties involve standby.

Applications, on forms obtainable from P. S. Watson, M.I.E.E., West Kent Manager, 270 High Street, Orpington, Kent, to be returned by December 29, 1951.

A. L. BURNELL,
Secretary.

December, 1951. (P 399)

CITY OF BULAWAYO

Electricity Department

(1) OVERHEAD MAINS ENGINEER
(2) UNDERGROUND MAINS ENGINEER

Gross commencing emoluments £1,145 per annum, plus Children's Allowances.

APPLICATIONS are invited for the above vacancies and they should be submitted in duplicate, one copy to reach the undersigned not later than January 9, 1952, and the other to Messrs. Merz and McLellan of Carliol House, Newcastle-upon-Tyne. Each application should contain full personal and professional details, and in the case of the copy submitted to the undersigned should be accompanied by an unmounted passport type photograph.

The commencing emolument will be in each case £1,014 10s. rising by annual increments of £39 17s. 6d. to £1,174, plus a standby allowance of £2 per month, children's allowances if applicable, and a transport allowance amounting to £10 18s. 5d. per month. This is based on a salary scale of £878 8s. rising by annual increments of £36 to £1,022 8s. plus a variable Cost of Living Allowance of £136 2s. at the commencement of the Grade and £151 1s. at the top.

Applicants for both these positions should preferably be Corporate Members of the Institution of Electrical Engineers, and have had general experience with a large electricity supply undertaking entailing a degree of responsibility that will enable the successful applicants to organise and control the respective sections in Bulawayo.

In Southern Rhodesia under existing conditions the successful applicant, if married and with two children, would not pay any income tax until the gross salary exceeds £1,120 per annum, excluding transport allowance.

The overhead mains engineer vacancy has already been advertised, but it is being re-advertised owing to certain changes having been made in the gross emolument applicable. Applicants for this vacancy should be capable of designing transmission and distribution lines both electrically and mechanically. They should be conversant with the ordering of materials for overhead electrical transmission schemes, competent to take charge of the erection of such schemes, familiar with schemes employing transmission voltages up to 66 kV and capable of carrying out switching operations together with modern methods of fault localisation and rectification.

Applicants for the underground mains engineer vacancy should have a thorough knowledge and experience of modern heavy switchgear practice, supertension cables, and modern protective practice. They should be familiar with schemes employing transmission voltages up to 33kV.

The children's allowance applicable to all vacancies is £30 per annum for the first child and £24 per annum for each of the next two children.

The successful applicants, if under the age of 50 years after serving a satisfactory probationary period of twelve months, will be required to join the pension fund on obtaining a satisfactory certificate from the Council's Medical Officer of Health.

The appointments will be subject to the Council's service, leave and sick leave regulations. Further details, if required, are available on application to Messrs. Merz and McLellan, Carliol House, Newcastle-upon-Tyne.

H. J. COOK,
Town Clerk.

P.O. Box 591,
Bulawayo,
Southern Rhodesia.
November 26, 1951. (P 311)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable positions:—

MECHANICAL MAINTENANCE ENGINEER
(TURBINE HOUSE),
Deptford West Generating Station.

Applicants should have had a sound engineering training, preferably have served an apprenticeship with a manufacturer of heavy engineering plant, and experience in the maintenance and repair of large turbine and auxiliary plant.

Salary and conditions in accordance with N.J.B. Agreement, Class "J," Grade 7, i.e., £831 12s. per annum inclusive of London Allowance.

SHIFT CHARGE ENGINEER,
Barnes Generating Station.

Applicants should have received a sound electrical and mechanical training with practical experience of the operation and maintenance of turbines, boilers and rotary convertors.

Salary and conditions in accordance with N.J.B. Agreement, Class "C," Grade 7, i.e., £807 19s. per annum inclusive of London allowance.

Applications for the foregoing, stating age, qualifications and experience should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, and and be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(P 403)

ELECTRICITY SUPPLY COMMISSION

Southern Rhodesia

VACANCY : TEST ASSISTANT

APPLICATIONS are invited for the above vacancy which exists at the Commission's Test Department, Salisbury.

Technical qualifications : Graduate I.E.E. or equivalent. Approximately 12 years' general experience in electrical testing is required. This period does not include apprenticeship which should preferably have been served in the testing department of a large overseas electrical engineering works.

Specific experience required is as follows :—

(1) To be fully conversant with the testing, dry-out and inspection of all types of power and distribution transformers, including on load tap changing units.
(2) Induction line voltage regulating equipment.
(3) Switchgear of all types.
(4) Condensers.
(5) Alternators and associated equipment.
(6) A.C. and d.c. motors, including control equipment.
(7) Checking and testing h.t. metering cubicles, switchboards and control panels manufactured and assembled at the Commission's workshops.
(8) General knowledge of instruments, meters and associated equipment. Instrument and meter secondary circuits.
(9) All test work involved in commissioning e.h.t. substation equipment, including transmission lines.
(10) The successful applicant would be required to supervise and direct staff placed under his control at any time.

Applicants should be, preferably, within the 30-35 years age group. Age limitation may, however, be waived in the event of the applicant's experience and qualifications being suited to the Commission's requirements. Salary scale : £766 10s. by £31 10s. to £861 per annum.

The general conditions of service include a contributory Provident Fund, Medical Aid Society, Holiday Fund, 45 days full-pay leave per annum, paid sick leave, child and dependant allowances where applicable. In addition to basic salaries at present a cost-of-living allowance of approximately 38% applies. Appointment will be subject to satisfactory medical examination and three months' probationary period.

Applications, giving age, educational and technical training and subsequent experience in chronological order, nationality, marital state with number and age of dependants, and enclosing copies of testimonials (which will not be returned) should be addressed to the Secretary, Electricity Supply Commission, P.O. Box 377, Salisbury, Southern Rhodesia, so as to arrive not later than January 21, 1952. (P 374)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the following superannuable positions:—

Vacancy No.

628 STATION SHIFT CONTROL ENGINEER. Westwood Generating Station, near Wigan, Lancs.
The salary will be £588 to £610 per annum, in accordance with Grade 10, Class "G."

629 SHIFT CHARGE ENGINEER. Radcliffe Generating Station, Lancs.
The salary will be £677 to £696 per annum, in accordance with Grade 7, Class "F."

630 SHIFT CHARGE ENGINEER. Wigan Generating Station, Lancs.
The salary will be £613 to £623 per annum, in accordance with Grade 7, Class "D."
The salaries for the above positions will be in accordance with the National Joint Board Agreement and candidates should possess a Higher National Certificate and have had experience in a generating station.

631 DRAUGHTSMEN (MECHANICAL). Generation Construction Department, Agecroft Generating Station, Pendlebury, near Manchester.
Candidates must have had experience in the layout of generating stations and general mechanical engineering.

632 DRAUGHTSMEN (ELECTRICAL). Generation Construction Department, Agecroft Generating Station, Pendlebury, near Manchester.
Candidates must have had experience in cable layouts and electrical diagrams.
Salaries will be dependent upon qualifications and experience and will be in accordance with Schedule "D" of the N.J.B. Agreement, that is: Senior Draughtsmen, Grade 5, £547 to £651; Engineering Draughtsmen, Grade 6, £413 to £547 per annum.

635 MAINTENANCE ENGINEER (MECHANICAL) Radcliffe Generating Station, Radcliffe, near Manchester.
The salary for the post will be £713 to £730 to £747 per annum, in accordance with Grade 6, Class "F" of

(*Continued in next column*)

(*Continued from previous column*)

the N.J.B. Agreement. Candidates should be members of the Institute of Mechanical Engineers or holders of an equivalent qualification, and should have had wide experience in the maintenance of power station plant and be capable of taking control of a large maintenance staff and machine shop, and of supervising turbine and boiler overhauls. A knowledge of the maintenance of the instruments would be an advantage.

Applications, quoting vacancy number, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishments Officer, 825 Wilmslow Road, Manchester 20, not later than December 22, 1951. (P 376)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

SHIFT CHARGE ENGINEER
Great Yarmouth Generating Station.

Salary in accordance with the revised N.J.B. Schedule A, Grade 7, Class "D" (£613-£623 per annum).

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Electrical and/or Mechanical Engineering or equivalent and possess experience in the operation of generating stations.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N. 14, to arrive not later than December 22, 1951. Envelopes should be endorsed "Shift Charge Engineer—Great Yarmouth."

W. N. C. CLINCH,
Controller.
Northmet House, Southgate, N.14. (P 397)

EASTERN GAS BOARD

Tottenham Division

APPLICATIONS are invited for the following appointments:—

POWER ENGINEER—Willoughby Lane Works

Candidates should be corporate members of the Institution of Electrical Engineers or hold an equivalent qualification.

The duties will mainly comprise:—

(a) Technical supervision of operation of steam and electric power plant.
(b) Supervision of electrical installation work, maintenance of electrical plant, including supervision of craftsmen.

Residence, adjoining the works, will be available in this case at a reasonable rental.

MECHANICAL ENGINEER—Divisional Office

Candidates should be corporate members of the Institution of Mechanical Engineers or hold an equivalent qualification.

The responsibilities cover the eight gas works of the Division and the duties will mainly comprise:—

(a) Supervision of all mechanical requirements under the Factories Acts, e.g. steam boilers and pressure vessels, gasholders, lifting appliances, etc.
(b) Safety precautions.
(c) Inspection of mechanical plant at makers' works and supervision of erection.

(The works engineers in each locality are responsible for mechanical maintenance.)

MECHANICAL ASSISTANT—Ponders End Works

Candidates should be corporate members of the Institution of Mechanical Engineers or hold an equivalent qualification.

The candidate appointed will be one of the two main technical assistants of the Works Engineer, the other being the production assistant. He will be responsible for mechanical and structural maintenance and must be capable of organising this work on a planned basis.

Candidates should have experience in steam and diesel plant and in the supervision of craftsmen.

Candidates for all the above posts should be between 27 and 45 years of age. The successful candidates will be required to pass a medical examination and to join such contributory superannuation scheme as the Board may adopt.

All the above appointments will be made within the Grade A.P.T. 11 (Metropolitan), £675 to £800 per annum, of the National Salary Scales for Gas Staffs.

Applications, stating age, qualifications, and experience, should reach the Personnel Officer, Woodall House, 658 Lordship Lane, London N.22, not later than January 1, 1952.

December 1, 1951. (P 377)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

STATION SUPERINTENDENT
Leicester Generating Station

APPLICATIONS are invited for the post of Station Superintendent at Freeman's Meadow Generating Station, Leicester.

In addition to having served a recognised engineering apprenticeship, applicants must have had a wide experience of the operation, maintenance and administration of a large modern generating station, and should preferably be corporate members of a recognised professional institution or hold equivalent qualifications.

The salary will be in accordance with Class "H," Grade 1 of Schedule A of the National Joint Board Agreement.

The appointment is subject to the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than December 26, 1951.

ASSISTANT ENGINEER (INSTRUMENTS)

Applications are invited from suitably qualified engineers for the position of Assistant Engineer (Instruments) at the Staythorpe Generating Station.

The chosen candidate will be responsible for the efficient maintenance of all types of instruments associated with the boiler and turbine plant.

Preference will be given to applicants who hold the Higher National Certificate in Electrical or Mechanical Engineering or equivalent qualifications.

The salary will be in accordance with Class "J," Grade 10, of the National Joint Board Schedule and the appointment will be subject to superannuation under the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than January 7, 1952.

L. F. JEFFREY,
Divisional Controller.
(P 373)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of ASSISTANT SECTION ENGINEER in the Warrington District of the Board's No. 2 Sub-Area. Salary N.J.B. F.9 (£587/to £609 p.a.)

Applicants should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers and have had experience in the h.v. and m.v. overhead and underground distribution work. The successful applicant will be required to undertake stand-by duties.

The appointment is superannuable and subject to medical examination.

Forms of application can be obtained from the Manager, No. 2 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Sandiway, nr. Northwich, Cheshire, to whom they should be returned so as to be received not later than January 5, 1952.

JAMES RANKIN,
Secretary.
(P 401)

CROWN AGENTS FOR THE COLONIES

TECHNICAL INSTRUCTOR (Electrical Engineering), required by the Nigerian Government Education Department for one tour of 18-24 months with prospect of permanency. Commencing salary according to age and experience in scale, £711 rising to £1,042 a year, including expatriation pay and temporary increase. Outfit allowance £60. Free passages for the officer and his wife and assistance towards cost of children's passages or their maintenance in this country. Liberal leave on full salary. Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They should possess recognised technological qualifications and have had experience of apprentice training.

Apply at once by letter, stating age, full names in block letters and full particulars of qualification and experience and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting on letter M.25341.B.

The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (P 396)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

APPLICATIONS are invited for the positions of SENIOR and SKILLED DRAUGHTSMEN in our Bridgend Works, preferably from men having a good knowledge of h.v. outdoor switchgear, fusegear and substation layout, but other applications will receive full consideration. Permanent positions with good salary.

Apply, in writing, with full particulars :

Chief Engineer,
LINE EQUIPMENT LIMITED
Bridgend, Glamorgan, South Wales
(P 429p)

A LARGE iron works in the Midlands has a vacancy for an ASSISTANT WORKS ELECTRICAL ENGINEER. Applicants, who should have a degree in electrical engineering and be corporate members of the Institution of Electrical Engineers, should be not less than 30 years of age and have experience in generation, all kinds of control gear, both a.c., e.h.t. and d.c., converting plant involving large direct currents, works distribution (underground and overhead), all kinds and sizes of electric motors a.c. and d.c. from fractional to 4,000 h.p., etc. Applicants, who should have served a recognised apprenticeship, preferably in a large manufacturing works, must, in addition to having the necessary technical qualifications, be able to control labour and organise work to the best advantage. —Reply, stating age, whether married or single, qualifications, experience, etc., in strict confidence to Box No. 1263, Electrical Times. (P 318)

A LARGE PAPER MILL, East Coast, requires highly qualified ELECTRICAL ENGINEER to assist Chief Electrical Engineer in supervision and maintenance of direct current plant.

Plant includes d.c. generators totalling 6,000 kW. and over 400 motors fractional to 400 kW.

Individual motor drives to paper machine sections synchronised by Harland electro mechanical differential speed regulators, employing latest Servo mechanism principles, these and other specialised drives employ complicated interlock switchgear.

The candidates would be required to undertake development, testing and checking of devices throughout the mill, ample scope for a keen and alert person with plenty of initiative who is not afraid of getting down to the job.

Remuneration according to qualifications. Age 27 to 35. Staff pension fund. Assistance given with housing problem.

Write, giving full particulars of education, experience, and present salary, to Technical Director, Peter Dixon and Son, Ltd., West Marsh Mills, Grimsby. (P 394)

A SKILLED ARMATURE WINDER to take charge of repair shop winding department. Good opportunity for keen man to join growing company.—The Lewis Electric Company, Moor Works, Blackamoor Lane, Maidenhead. Tel. 2386. (P 256)

AN OPPORTUNITY occurs with a well-known company for suitable WOMEN to be trained as WASHING-MACHINE ADVISERS. Knowledge of household electrical appliances and domestic science preferred. Must be mobile. Vacancies in London and the Provinces.—Apply to Box No. 1267, Electrical Times. (P 323)

ASSISTANT TO MANAGING DIRECTOR required by Scottish company engaged in the production of temperature control equipment. Age about 30. Good engineering degree or equivalent, practical training essential, and a knowledge of electronics. Must be capable of original research, development, and design. Initial salary, £700 to £900 per annum, depending on experience. Pension scheme. Excellent prospects for suitable candidate.—Write, 04X1, Wm. Porteous and Co., Glasgow. (P 380)

ASSISTANT REQUIRED by consulting engineer. Must be experienced in use of insulation and continuity testing sets, also conversant with modern a.c. and d.c. power and light circuits.—Apply Box No. 1275, Electrical Times. (P 340)

ASSISTANT SUPERINTENDENT required by old established firm of electric cable makers for technical duties in a North of England factory. Salary according to age and qualifications, £600-£750 per annum.—Apply, stating age, qualifications and experience, to: Box No.1299, Electrical Times. (P 424)

COMPANY manufacturing diesel electric locomotives invites applications for the following staff:— DESIGNER DRAUGHTSMEN AND DRAUGHTSMEN who are experienced in the electrical and mechanical design of d.c. control equipment. Good salaries paid to men with exceptional qualifications. Three years agreement and every facility to find suitable living accommodation will be given. Staff Assurance scheme and good working conditions. Applications from men with industrial control gear experience will also be considered. Offers only to first-class men.—Please apply, giving full details of training, experience, age, etc., to Box No. 1253, Electrical Times. (P 278)

CONTRACTS ENGINEERS required by prominent switchgear manufacturers. Appointments are in connection with export and home sales, and offer opportunities for eventual overseas or outside representation. Candidates should have gained at least Ordinary National Certificate or an engineering degree, and have had suitable works training.—Applications, giving full details of age, qualifications and experience, should be addressed to the Personnel Manager, A. Reyrolle and Co. Ltd., Hebburn, County Durham. (P 354)

DRAUGHTSMAN required with experience in detail and production drawings of fluorescent and tungsten lighting fittings, Strand area. 5-day week. Pension scheme.—Apply in writing, stating age, experience and salary required, to Personnel Manager, Ekco-Ensign Electric Ltd., 226 Strand, W.C.2. (P 392)

DRAUGHTSMEN. Seniors and Juniors required for switch gear design and application, previous experience of switch gear not essential.—All inquiries to be addressed to the "Personnel Officer," B.T.H. Co., Ltd., 20 Neasden Lane, Willesden, N.W.10. (P 405)

DRAUGHTSMEN (one senior, one junior), ELECTRICAL. Age range, 24-48. Experienced l.t. control gear, plant layout, and diagrams. Must have sound recognised apprenticeship and possess Higher National Certificate or equal. Site within easy reach of Wolverhampton. Good pension scheme (compulsory), canteen facilities, five-day week. State age, present salary, give references and detail apprenticeship training.—Box No. 1259, Electrical Times. (P 299)

DRAWING AND TRACING, LTD., have vacancies for experienced SENIOR DRAUGHTSMEN and JUNIOR DETAIL DRAUGHTSMEN in their production drawing office, specialising in radio, electrical and mechanical engineering. 5-day week. Pension scheme. Good working conditions. Salary range £390-£533.—Write, stating age and experience, 456 Ewell Road, Surbiton, Surrey. (P 431)

EDITORIAL ASSISTANT, in a senior capacity, for Electrical Engineering Journal. Engineering or Science Degree necessary, and also experience in subediting of high-class technical copy. Knowledge of foreign languages advantageous. Age approximately 30-35. Salary according to qualifications and experience.—Box No. 1297, Electrical Times. (P 423)

ELECTRICAL MANUFACTURERS require REPRESENTATIVE for London area with prospect of service later in the Middle East. Age 30/35. Excellent opportunity.—Apply, giving full particulars experience, etc., to Box No. 1279, Electrical Times. (P 360)

ELECTRICAL WHOLESALERS (West End) require SALES ORDER ASSISTANT, good knowledge trade and catalogues, used to telephone orders. TRADE-COUNTER AND STORES ASSISTANT, good knowledge trade. Good salary and prospects.—Supra Electrical Co., Ltd., 26 Soho Square, W.1. (P 393)

ELECTRICIAN MATES required, conversant with usual duties. Copies of references must be enclosed with application.—Box No. 1271, Electrical Times. (P 327)

ELECTRICIANS required, fully experienced with site maintenance, including lighting, heating, power, a.c. and d.c. supplies. Copies of reference must be enclosed with application.—Box No. 1269, Electrical Times. (P 326)

ENGINEERS (JUNIOR) required London Generating Station. Good advancement prospects. Conditions N.J.B. Electricity Supply. Commencing salary from £400 dependent on qualifications, experience and station size. Apprenticeship or practical training suitable to industry. Graduate Member of Institution, university degree, or H.N.C. advantageous. — Applications to Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, S.W.1. (P 406)

GUILDFORD electrical contractors require SUPERVISING FOREMAN. First-class practical experience of general installation work essential. Every assistance afforded by directorate to man of ability and initiative.—Apply in first instance, giving copies of any recent testimonials and stating initial salary required, to Box No. 1287, Electrical Times. (P 391)

KUWAIT OIL CO. require an ASSISTANT ELECTRICAL ENGINEER (DESIGN) for service in Kuwait. Must possess full electrical apprenticeship and higher National Certificate. Graduate members of I.E.E. will be given preference. Must have experience in mains design and planning up to 11,000 V. Planning of industrial layouts an advantage. Age 30-35. Salary starting £830 p.a. clear, plus generous allowances, pension scheme and kit allowance.—Write, giving personal details and quoting K.1391, to Box D/80, at 191 Gresham House, E.C.2. (P 315)

KUWAIT OIL CO. invites applications for the post of ASSISTANT ELECTRICAL ENGINEER (INSTALLATION) in Kuwait. Required for installation of high-voltage switchgear and plant up to 11,000 V and motors up to 500 h.p.; also the checking of complex protective relays. Mechanical experience an advantage. Must possess Higher National Certificate, but preference given to corporate members of I.E.E. Age 30 to 35. Salary starting £830 per annum, plus generous allowances, kit allowance and pension scheme.—Write, giving personal details and quoting K.1386, to Box D/61, at 191 Gresham House, E.C.2. (P 314)

LIGHTING ENGINEER required. Used to preparation fluorescent lighting schemes. Must have full technical knowledge. Excellent prospects. London district. Replies treated in strict confidence.—Box AC 68036, Samson-Clarks, 57-61 Mortimer Street, W.1. (P 404)

METER READER AND CLERK required, conversant with usual duties. Copies of references must be enclosed with application.—Box No. 1273, Electrical Times. (P 328)

PROMINENT FIRM of lift engineers require for their head office in London a TECHNICIAN capable of designing schemes and preparing estimates for all classes of lift installations. The position has excellent prospects of leading to a post of high responsibility.—Write, stating age, details of experience and salary required, to M.B.P., 51 Clerkenwell Close, E.C.1. (P 312)

SALES MANAGER required by large, long-established engineering company. Must have first-class technical knowledge, preferably with university degree in electrical engineering. Extensive experience of electronics essential. Position offers wide scope for really live man possessing initiative and sales ability of high order.—Write, giving full details of age, education and positions held, to Box E.T. 609, at 191 Gresham House, E.C.2. (P 316)

SENIOR SALES ENGINEER required by large S.E. London company. Applicants, who must have had experience of telephone and ancillary equipment, should possess a degree or its equivalent and had not less than 10 years industrial/commercial experience. Able to control tendering staff and represent the company in its dealings with customers' senior engineers. A good salary will be paid to the selected applicant, based on ability, experience and qualifications.—Write, giving full details to Box No. 1291, Electrical Times. (P 418)

SWITCHGEAR DRAUGHTSMEN required for layout and contract work. Opportunities for advancement to engineering grades.—Give full particulars of experience, salary, etc., to Ferguson Pailin Ltd., Higher Openshaw, Manchester 11. (P 356)

TECHNICAL ASSISTANT required for the electrical laboratory of manufacturer of paper-insulated cables up to the highest voltages. University degree or H.N.C. standard desirable. The situation is a progressive one, with good prospects and the salary paid will be in accordance with the attainments and ability of the applicant. Age 22 to 35 years.—Box No. 1285, Electrical Times. (P 381)

TECHNICAL ASSISTANT required for London with experience of overhead transmission and distribution lines and up to Higher National Certificate standard in Electrical and Civil Engineering Pension Fund. Staff canteen. 5-day week. Salary according to qualifications and experience.—Apply in writing to Staff Officer, British Insulated Callender's Construction Co. Ltd., 21 Bloomsbury Street, London, W.C.1. (P 379)

TECHNICAL (ELECTRICAL) SALES ASSISTANT required by Pilkington Brothers Ltd., Glass Manufacturers, St. Helens, for their Power Line Insulator Department. Previous sales experience in the electrical industry and ability to handle correspondence essential. Qualifications: preferably H.N.C., but would consider O.N.C. Job will be internal to commence with, but may offer prospects for travelling later.—Applications should be addressed to the Chief Personnel Officer, Pilkington Brothers Ltd., St. Helens, Lancashire. (P 317)

THE BRUSH ELECTRICAL ENGINEERING CO. LTD., Loughborough, Leics., have vacancies in their transformer department for DRAUGHTSMEN with good basic training in general engineering. Previous transformer experience not essential. Excellent opportunities for advancement under good working conditions for the right type of men.—Applicants should write, giving full details of training, experience, etc., to the Central Labour Dept. (P 253)

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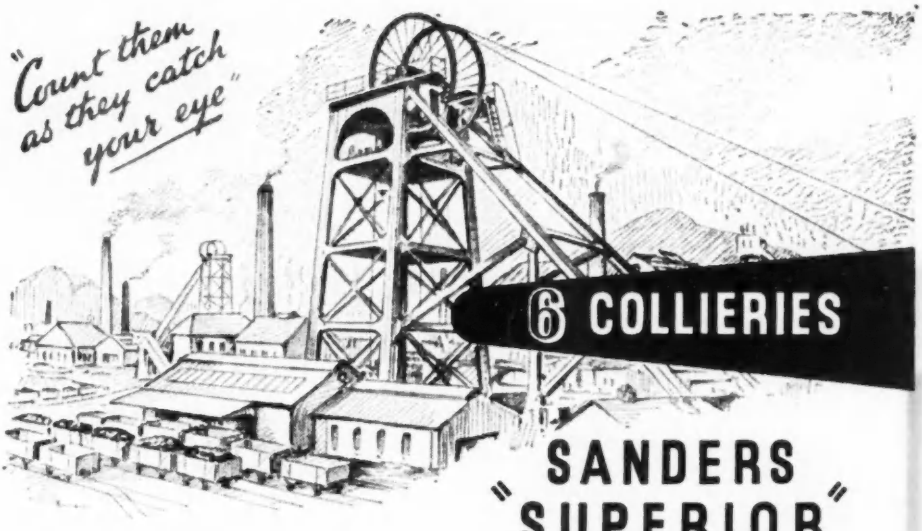

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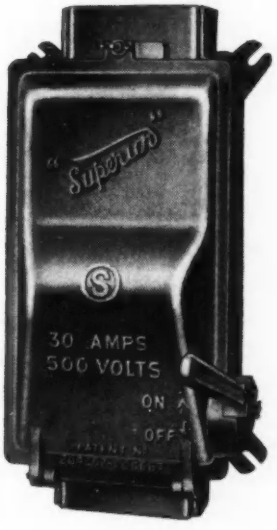

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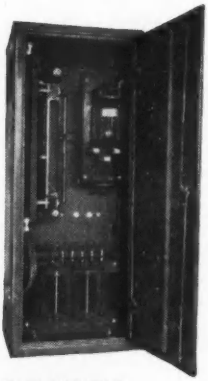

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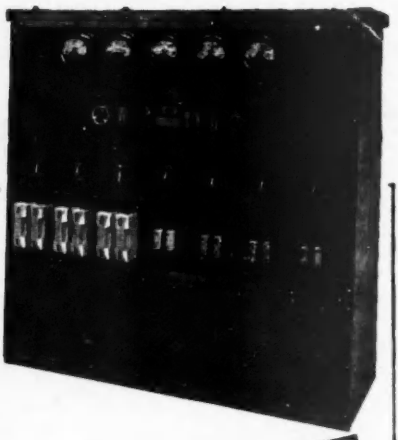

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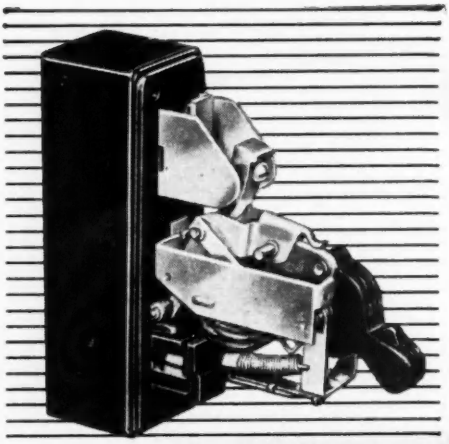

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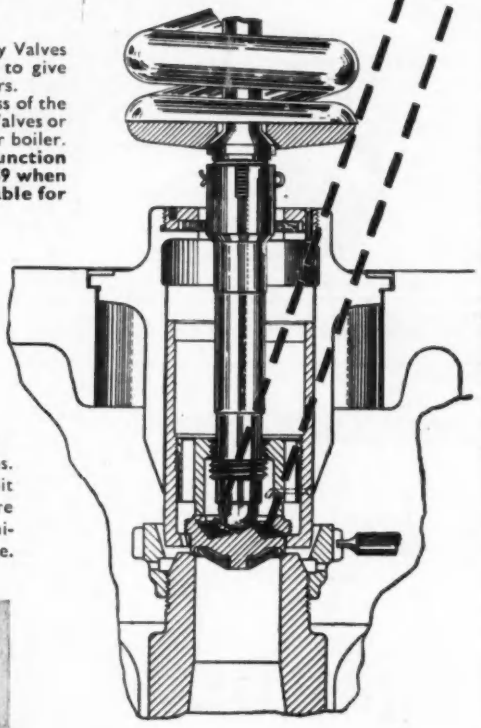

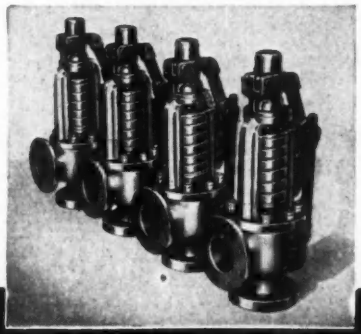

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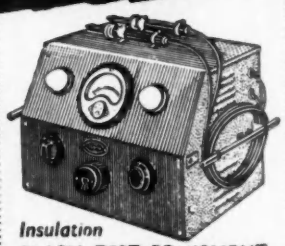

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transformers

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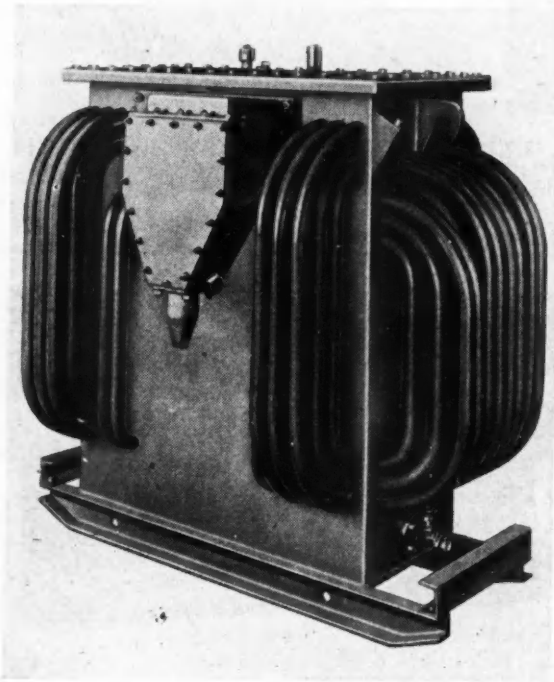

The 'ENGLISH ELECTRIC' standard range of distribution transformers includes sub-station transformers with three-phase ratings of 100, 150, 200, 250, 300, 400 and 500 kVA. Standard voltage ratio is 11,000/433 volts; other voltage ratios can be supplied to order, while either tapping links or tapping switches can be provided as required. All transformers can be fitted with a conservator.

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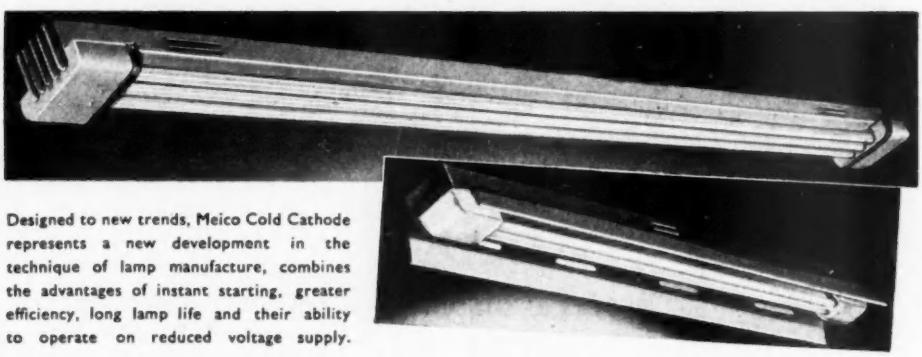

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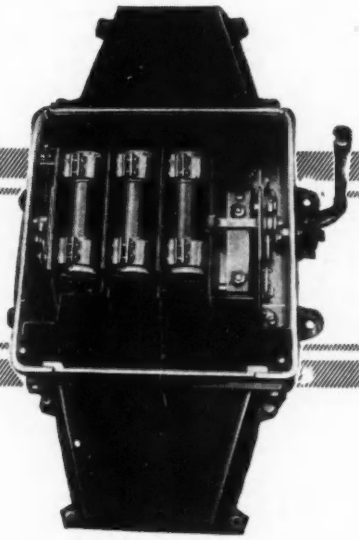

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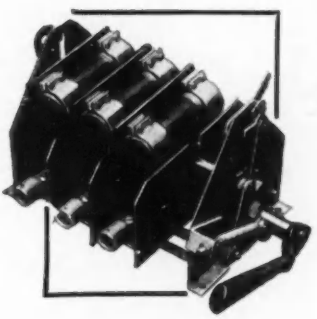

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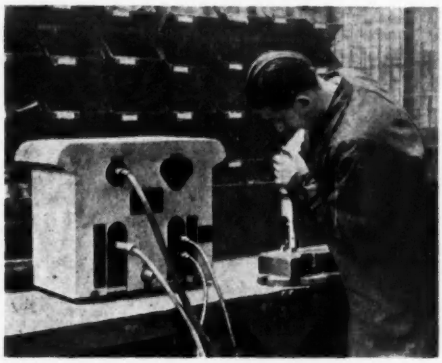

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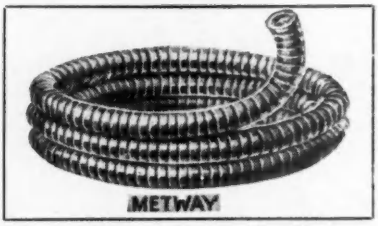

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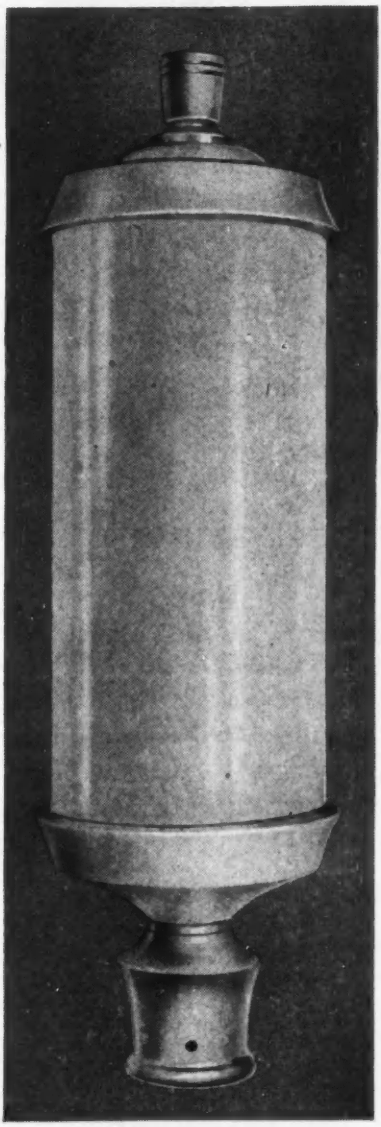

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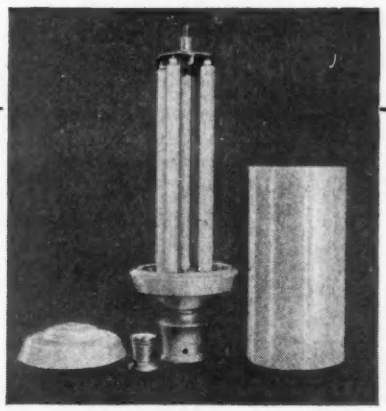

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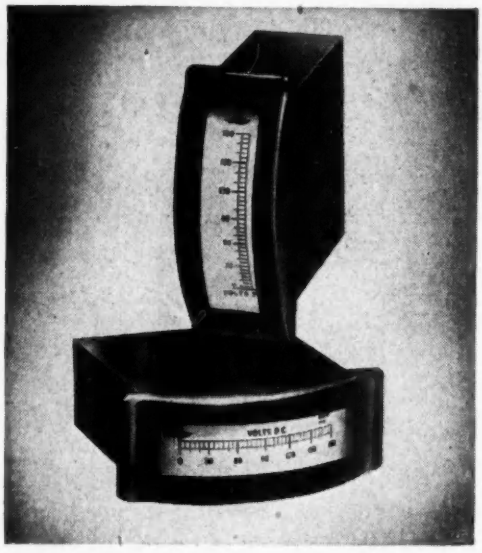

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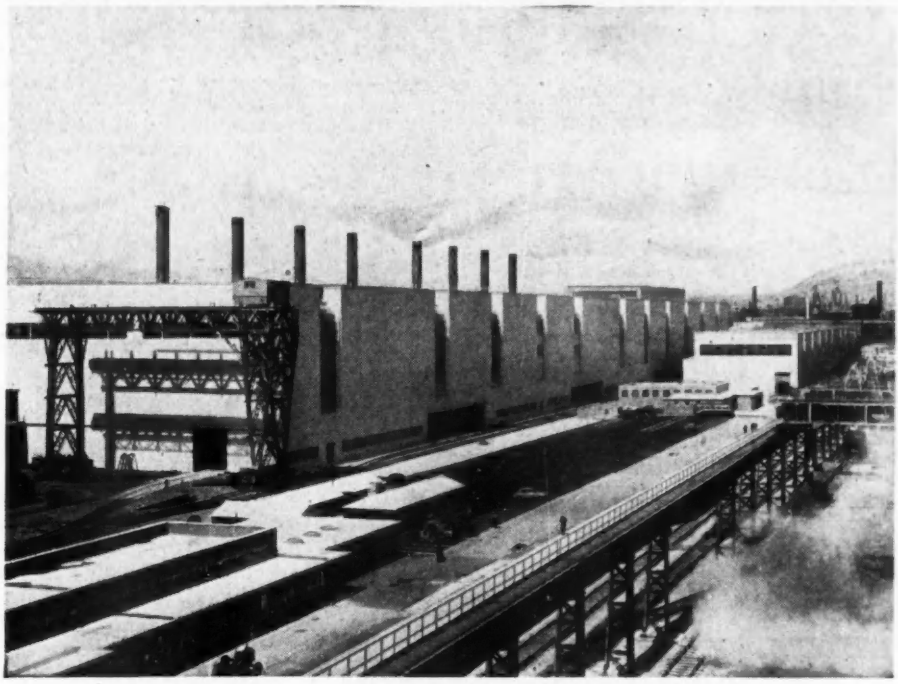

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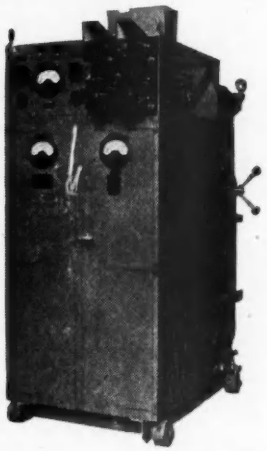

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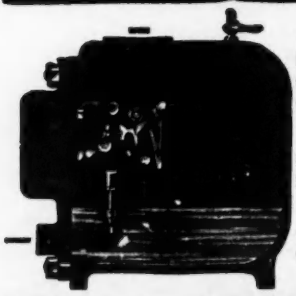

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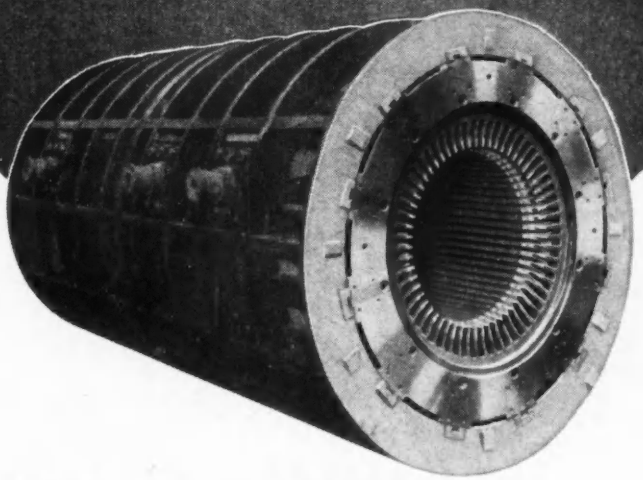

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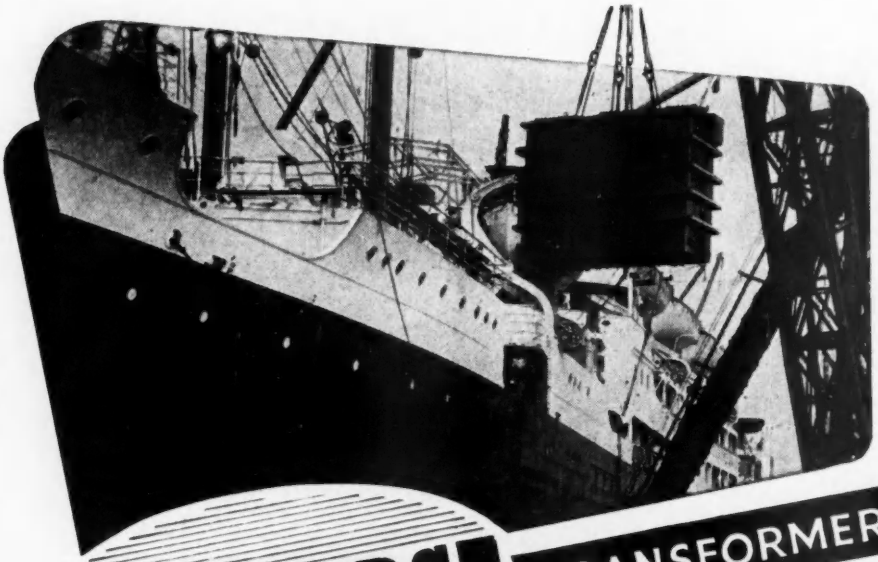

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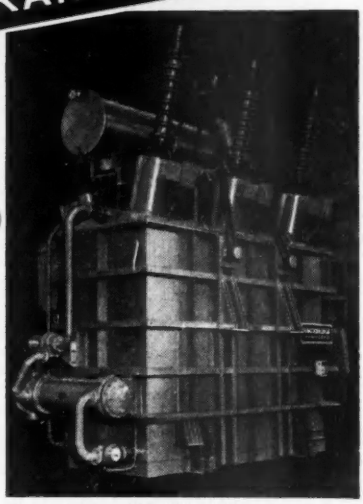

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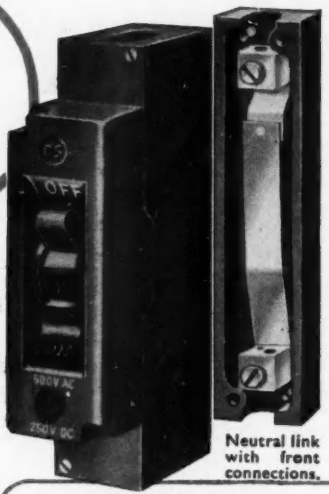

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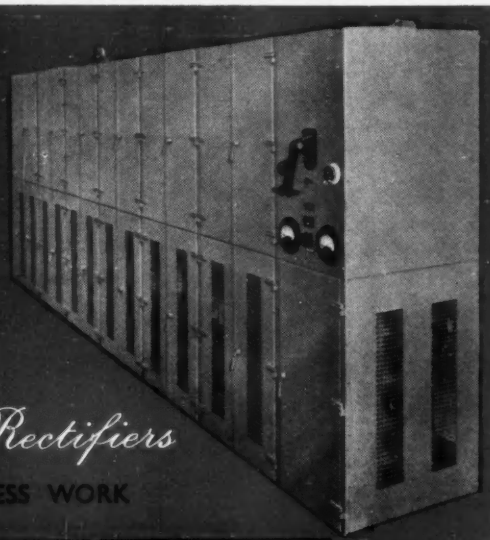

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